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HAWKER 800EX PILOT TRAINING MANUAL VOLUME 1

Record of Revision No. 1

This is a complete reprint of the *Hawker 800EX Pilot Training Manual.*

The portion of the text or figure affected by this revision is indicated by a solid vertical line in the margin. A vertical line adjacent to blank space means that material has been deleted. In addition, each revised page is marked “Revision 1” in the lower left or right corner.

The changes made in this revision will be further explained at the appropriate time in the training course.

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HAWKER 800 XP
PILOT TRAINING MANUAL

VOLUME 1
OPERATIONAL INFORMATION

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NOTICE

The material contained in this training manual is based on information obtained from the aircraft manufacturer's Pilot Manuals and Maintenance Manuals. It is to be used for familiarization and training purposes only.

At the time of printing it contained then-current information. In the event of conflict between data provided herein and that in publications issued by the manufacturer or the FAA, that of the manufacturer or the FAA shall take precedence.

We at FlightSafety want you to have the best training possible. We welcome any suggestions you might have for improving this manual or any other aspect of our training program.

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EXPANDED CHECKLIST

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NORMAL PROCEDURES

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NORMAL PROCEDURES

PRELIMINARY COCKPIT/CABIN INSPECTION

NOTE

These checks should be done prior to the exterior inspection. The purpose of this is to ensure that the airplane is ready to start, following the completion of the exterior inspection.

1. Circuit Breakers ..... SET
2. LP Cocks ..... UP
3. XFEED and Transfer Levers ..... UP
4. HP Cocks ..... CLOSED
5. Thrust Reverser Power Switches ..... OFF
6. Thrust Reverser Levers ..... STOW
7. Battery Switch ..... ON/CHECK VOLTAGE

   Check PS1 and PS2 for zero volts.
8. Brakes ..... PARK
9. Landing Gear Handle ..... DOWN
10. AUX Hydraulic System ..... CHECK/RESET
11. Trims ..... CHECK/RESET
12. Control Locks ..... AS REQUIRED
13. Overhead Panel ..... CHECK
14. Fire-Extinguisher Switches ..... OFF, INDICATORS CLEAR
15. Fuel Quantity ..... CHECK
16. Oxygen Quantity ..... CHECK
17. TKS Quantity ..... CHECK

18. Battery Switch ..... OFF

19. Cockpit Emergency Equipment ..... CHECK

20. Cockpit Windows ..... AS REQUIRED

21. Refuel Panel ..... AS REQUIRED

22. Manuals/Documents ..... ON BOARD

PASSENGER CABIN

1. First Aid Kit ..... ON BOARD

2. Cabin Windows..... FREE FROM CRACKS AND OTHER DAMAGE

3. Cabin Fire Extinguisher ..... CHECKED

4. Emergency Exit ..... CLOSED, SECURITY PIN REMOVED

5. Galley ..... SERVICED

6. Lavatory ..... SERVICED

7. Passenger Seats and Tables ..... SECURE, SEAT BELT CONDITION, STOWED

8. Cabin Safety Equipment ..... CHECKED

9. Preliminary Cockpit /Cabin Inspection ..... COMPLETE

NOTE

Complete the walkaround.

EXTERIOR INSPECTION

FUSELAGE NOSE—LEFT SIDE

1. Entrance Door ..... SEAL, HANDRAIL LINKAGE, CONDITION

2. Lower Static Vents ..... PLUGS REMOVED, HOLES CLEAR

3. Airflow Angle Sensor Vane..... FREEDOM OF MOVEMENT

4. Pitot Probe ..... COVER REMOVED, HOLE CLEAR

5. Upper Static Vents ..... PLUGS REMOVED, HOLES CLEAR

6. Air Temperature Probe ..... UNDAMAGED

7. Rotary Ice Detector..... ROTOR FREE

8. Radome..... LOCKED, UNDAMAGED

9. Nose Taxi Lights..... LENSES CLEAN, UNDAMAGED

10. Nose Wheel Well ..... GENERAL CONDITION

11. Auxiliary Hydraulic Reservoir..... FULL, NO LEAKS

12. Nose Gear Downlock Pin..... REMOVED

13. Nose Wheel Well Doors ..... CLOSED, SECURED

14. Nose Steering Pins (2)..... lNSTALLED

    The nose steering pin should be installed in the vertical position with the pip pin locked in place.

15. Nose Strut..... CLEAN, NO LEAKS, PROPER EXTENSION

16. Nose Tires..... CONDITION

FORWARD FUSELAGE—RIGHT SIDE

17. Upper Static Vents..... PLUGS REMOVED, HOLES CLEAR

18. Pitot Probe ..... COVER REMOVED, HOLE CLEAR

19. Airflow Angle Sensor Vane..... FREEDOM OF MOVEMENT

20. Lower Static Vents ..... PLUGS REMOVED, HOLES CLEAR

22. Pressurization Venturi Outlet..... CLEAR

23. Emergency Exit ..... CLOSED, FLUSH FIT

24. Dorsal Air Intake ..... PLUG REMOVED

RIGHT ENGINE

25. Engine Intake..... COVER REMOVED, NO VISIBLE DAMAGE

26. P_2 T_2 Sensor ..... UNDAMAGED

27. Fan Blades ..... UNDAMAGED

28. Starter/Generator Air Intake ..... CLEAR

RIGHT WING

29. Wing Ice Inspection Light ..... CHECKED

30. SAT/TAS Probe ..... CONDITION

31. Wing Top Surface ..... GENERAL CONDITION

32. TKS Panels ..... CLEAN, UNDAMAGED

33. Stall Strip ..... SECURE

34. Landing and Taxi Lights ..... CLEAR, UNDAMAGED

35. Wing Vortilon ..... SECURE, UNDAMAGED

36. Vortex Generators ..... SECURE, NONE MISSING

37. Wing Fuel Cap ..... SECURE

38. Navigation and Strobe Lights ..... LENS CLEAN, UNDAMAGED

39. Wing Undersurface ..... NO FUEL LEAKS, STALL VENT CLEAR

40. NACA Vent ..... CLEAR

41. Aileron and Servo Tab ..... CONDITION, STATIC WICKS SECURE

42. Upper Airbrake ..... SECURE, UNDAMAGED

43. Flap ..... CONDITION, SECURE

44. Lower Airbrake ..... SECURE, UNDAMAGED

RIGHT MAIN GEAR

45. Fairing and Doors ..... CONDITION, SECURE

46. Wheel Well ..... CONDITION, NO LEAKS

47. Right Gear Down Lock Pin ..... REMOVED

48. Spring Strut ..... CHECKED

49. Shock Strut ..... CLEAN, NO LEAKS, PROPER EXTENSION

50. Brake Lines ..... UNDAMAGED, NO LEAKS

51. Wheels, Tires, and Brakes ..... CONDITION

FUEL TANKS

52. Water Drain Valves ..... CHECKED, AFTER FUEL SERVICING

KEEL

53. Anticollision Light ..... UNDAMAGED

54. Antennas ..... UNDAMAGED

REAR EQUIPMENT BAY

55. Hydraulic Accumulators ..... MAIN (50 MINIMUM)
EMERGENCY BRAKE (950 MINIMUM)
THRUST REVERSER (1,450 MINIMUM)

56. Hydraulic Reservoir ..... CHECK FLUID LEVEL

57. Hydraulic Reservoir Pressure Gage ..... WITHIN LIMIT

58. High-Pressure Hydraulic Filter Pin ..... NOT EXTENDED

59. Batteries ..... CONNECTED, SECURE

60. Fuel Computers ..... BITE SWITCH IN #1 POSITION

61. Stick Pusher Assembly ..... SECURE, NO LEAKS

62. APU ..... CONDITION, NO LEAKS

63. Rear Bay Light Switch ..... OFF

64. Equipment Bay Door ..... CLOSED, LATCHED

RIGHT ENGINE

65. Cowling and Latches ..... SECURE, LOCKED

66. Drain Mast..... NO LEAKS AND CLEAR

67. Engine Oil Level..... CHECKED

68. Oil Filter Bypass Pin..... NOT EXTENDED

69. Thrust Reverser Safety Pin ..... REMOVED

70. Turbine Blades and Exhaust Section..... CONDITION

REAR FUSELAGE

71. Ground Power Receptacle..... DOOR SECURED

72. Pressure Refueling Cap and Door ..... SECURE, DOOR CLOSED

73. Oxygen Charging Panel ..... DOOR SECURED

74. Tail Cone..... LATCHED, SECURE, VENTS CLEAR

75. Navigation Light..... CONDITION

76. Vertical Stabilizer and Rudder ..... CONDITION, STATIC WICKS SECURE

77. Horizontal Stabilizer and Elevators..... CONDITION, STATIC WICKS SECURE

78. Anticollision Light..... CHECKED

79. Ventral Tank Fuel Cap..... SECURE, DOOR CLOSED

80. Fire-Extinguisher Discharge Indicators ..... SECURE

LEFT ENGINE

81. Cowling and Latches..... SECURE, LOCKED

82. Engine Oil Level..... CHECKED

83. Oil Filter Bypass Pin..... NOT EXTENDED

84. Drain Mast..... NO LEAKS AND CLEAR

85. Turbine Blades, and Exhaust Section..... CONDITION

86. Thrust Reverser Safety Pin ..... REMOVED

LEFT MAIN GEAR

87. Toilet Tank Service Door ..... CLOSED
88. Fairing and Doors ..... CONDITION, SECURE
89. Wheel Well ..... CONDITION, NO LEAKS
90. Left Gear Downlock Pin ..... REMOVED
91. Spring Strut ..... CHECKED
92. Shock Strut ..... CLEAN, NO LEAKS, PROPER EXTENSION
93. Brake Lines ..... UNDAMAGED, NO LEAKS
94. Wheels, Tires, and Brakes ..... CONDITION

LEFT WING

95. Lower Airbrake ..... SECURE, UNDAMAGED
96. Flap ..... UNDAMAGED
97. Upper Airbrake ..... SECURE, UNDAMAGED
98. Aileron and Servo Tab ..... CONDITION, STATIC WICKS SECURE
99. Navigation and Strobe Lights ..... LENS CLEAN, UNDAMAGED
100. Wing Undersurface ..... NO FUEL LEAKS, STALL VENT CLEAR
101. NACA Vent ..... CLEAR
102. Vortex Generators ..... SECURE, NONE MISSING
103. Wing Fuel Cap ..... SECURE
104. Wing Vortilon ..... SECURE, UNDAMAGED
105. Landing and Taxi Lights ..... CLEAR, UNDAMAGED
106. Stall Strip ..... SECURE

107. TKS Panels ..... CLEAN, UNDAMAGED

108. Wing Top Surfaces ..... GENERAL CONDITION

109. Wing Inspection Light ..... CHECKED

LEFT ENGINE

110. Engine Intake ..... COVER REMOVED, NO VISIBLE DAMAGE

111. P_2 T_2 Sensor ..... UNDAMAGED

112. Fan Blades ..... UNDAMAGED

113. Starter/Generator Air Intake ..... CLEAR

BEFORE STARTING ENGINES CHECKLIST

EXTERNAL, APU, OR BATTERY

† 1. Parking Brake ..... SET

During the preflight inspection of the rear equipment bay, either the emergency accumulator or the main accumulator should have indicated a minimum of 1,750 psi to fully activate the parking brakes.

2. Preflight ..... COMPLETED

3. Covers/Pins/Plugs ..... REMOVED

This includes the engine and pitot covers, dorsal vent, wing stall vents, static plate plugs, and three landing gear pins. The nose steering pin should be installed in the vertical position with the pip pin in place.

4. Circuit Breakers ..... CHECK

5. External Power Switch ..... OFF

6. External Battery Charge Switch ..... OFF

† 7. Battery Switch ..... ON, BATT #1, #2, #3, #4, CHECKED 23 VOLT MIN

8. Generator Fail Lights ..... ON

Both GEN 1 FAIL and GEN 2 FAIL lights should be illuminated. If not illuminated, either the annunciator bulb, or the generator line contactor (GLC) has failed closed.

9. Exterior Lights..... SET

The navigation lights should be turned on whenever the APU or a GPU applies power to the airplane, and the rotating beacon should be turned on just before starting engines.

10. Gear Handle..... ON, THREE GREEN LIGHTS

† 11. Electric Power..... AS REQUIRED (APU or GEU)

† 12. Bus Tie..... CLOSE (APU ONLY)

After the APU start, the bus tie must be closed in order to power the PS1 bus bar, as the APU generator is connected to the PS2 bus bar. After a GPU start the bus tie remains open, and all buses, including the start bus, are powered by the GPU.

† 13. DC Voltage ..... CHECKED

14. Pressurization Override Switch ..... AUTO

If this switch is in the override position, and if any source of bleed air is introduced to the cabin, the cabin will pressurize.

† 15. Inverters..... ON AND CHECKED

Turn the standby inverter to the ARM position. The STBY INV ON light should illuminate, and the XE FAIL and INST 1 FAIL (if installed) lights should extinguish.

Start No. 1 inverter–INV 1 FAIL, XS 1 FAIL, XS FAIL, XS 2 FAIL, and STBY INV ON annunciator lights should be extinguished, and INV 2 FAIL light should remain illuminated.

Start No 2 inverter, and stop No. 1 inverter–INV 1 FAIL light should illuminate, and all other lights should remain extinguished.

Start No. 1 inverter–INV 1 FAIL light should extinguish.

16. APU Bleed Air Switch..... AS REQUIRED

Turn the APU air on if heating or cooling of the cabin is desired. Changes in the temperature may now be accomplished with the cabin temperature selector.

† 17. Radio Master/EFIS (1 and 2)..... ON

Some aircraft have separate switches for the radio masters and the EFIS (1 and 2). Others have these two functions combined.

18. IRU (If Installed) ..... NAV

† 19. Standby Horizon ..... ON

20. Overhead Panel:

* a. Alternators ..... OFF/LIGHTS ON

The annunciator lights (ALTR 1 FAIL and ALTR 2 FAIL) on the overhead should be illuminated.

* b. Test Panel ..... TEST ALL SYSTEMS

Test all systems as follows:

STALL 1 ..... PRESS

This activates the stick shaker. As the test button is held, the stick shaker starts, followed shortly by an IDENT 1 annunciator.

STALL 2 ..... PRESS

This activates the stick shaker. As the test button is held, the stick shaker starts, followed shortly by an IDENT 2 annunciator.

STALL 3 ..... PRESS

Stall IDENT 3 annunciator illuminates (no shaker).

NOTE

Before any flight on which the aircraft is to be deliberately stalled, push any two of the STALL 1, STALL 2, and STALL 3 TEST buttons at the same time, check that the stick shaker operates. In addition, STALL VLV A OPEN and STALL VLV B OPEN lights on the pilot's and copilot's instrument panel illuminate and stick pusher operation occurs if hydraulic pressure is available and the stick held aft of the neutral position.

ENG FIRE 1 ..... ISOLATE BELL, PUSH AND HOLD BUTTON

Confirm that five lights (one above the HP cock, two master warning lights, a red repeater light on the master warning panel, and the ENG FIRE light on the roof panel) are illuminated; activate the bell and release ENG FIRE 1 TEST.

ENG FIRE 2 ..... REPEAT AS WITH FIRE 1 TEST

HP AIR OVHT ..... PRESS

Four lights (two master warning lights and two HP AIR OVHT lights on the center annunciator panel) should illuminate.

ICE DET ..... PRESS

The ICE DETECTED annunciator illuminates, staying on for approximately 30 seconds. This indicates that the ice detector circuit is functioning.

CABIN ALT ..... PRESS

A horn sounds and can be canceled by the HORN ISOLATE button on the left throttle. The CABIN ALTITUDE annunciator also illuminates. Cancel the flashing MWS lights.

† c. Emergency Lights ..... ARM

*† d. TKS ..... CHECK QUANTITY/PRIME

Check the gage on the copilot's side console, and prime by activating for two minutes. At the end of two minutes a chime should be heard, indicating that the TKS system is no longer activated.

e. Ice Detector Switch ..... AUTO

The ice detector will be activated at lift-off in the AUTO switch position.

f. Refuel Light ..... OUT

If the REFUEL ON light is illuminated, a refueling valve is open and must be shut prior to flight.

g. No Smoking Switch ..... AUTO

h. Screen Heat ..... OFF

* i. Pitot/Vane Heat ..... CHECK/OFF

j. Engine Anti-ice ..... OFF

k. Engine Ignition ..... OFF

l. Engine Computers ..... OFF, LIGHTS ON/AUTO, LIGHTS OUT

If an engine computer light fails to extinguish when the switch is in the auto mode, the situation must be corrected prior to flight.

m. Engine Synchronizer ..... OFF

n. Cabin Flood Switch ..... AS REQUIRED

This function allows rapid heating or cooling of the cabin, when APU air is available.

o. Cabin Floor Switch ..... AS REQUIRED

p. Cabin Fan ..... AS REQUIRED

q. Cabin Temperature ..... AUTO/SET

r. Flight Deck Heat ..... CLOSED

s. Main Air Valves ..... CLOSED

t. Seat Belt Sign ..... ON

† 21. Stall Identification Diagnostic Panel ..... RESET

Reset SSU fault if doll's eyes are white. Reset any stall channel previously inhibited.

22. Oxygen System ..... ON/CHECK, PAX ON

A contents gage reading FULL indicates the oxygen system is fully charged to a nominal 1,800 psi. Check the contents are sufficient for the intended flight duration.

23. Therapeutic Oxygen ..... AS REQUIRED

24. Nose Wheel Steering ..... CLEAR/CHECK INDICE

Agrees with actual nosewheel position.

25. Cockpit Voice Recorder (If Installed) ..... TEST

26. Audio Panels ..... SET

* 27. Davtron Clocks ..... SET

* 28. AHRS Panels ..... MAG

Honeywell Avionics:

* 29. Reversionary Modes ..... CHECKED/SET

Check the operation of the pilot and copilot symbol generator reversionary button and backup function of the MFD rotary mode selector.

* a. Electric Trim ..... TEST

* b. EFIS Ground Test (Left and Right)..... COMPLETE

NOTE

EFIS ground test and comparator warning systems are checked simultaneously.

Press the TEST button on the DC-810 display controller. Verify the following:

- Radar altimeter reads value, approximately 100 feet.
- All digital readouts are replaced with dashes (except radar altimeter).
- All flags are in view.
- Command view is in view.
- Test appears in upper left corner of EADI.

* c. Flight Instruments..... CHECK

Collins Avionics:

* 29. Transfer Panel ..... SEVEN GREEN LIGHTS

The transfer light pushbutton switches select either normal (green) on the same side or the amber for transfer of display from the EADI to the EHSI of the MFD. It also has cross-data capability from the opposite side for the AHRs and air data systems.

* a. EFIS Ground Test (Left and Right)..... COMPLETE

NOTE

EFIS ground test and comparator warning systems are checked simultaneously.

Depress the pilot's EFIS ground test and hold it in:

- Note the 10° is added to the current values of pitch and roll and 20° is added to heading, with a positive increment added to the pilot's side.

- Note that the word "TEST: in red appears on the EADI and the MFD and that the comparator logic causes flashing PIT (pitch), ROL (roll), and HDG (heading) comparator warning messages to show on the EADI and MFD and the comparator warning on the flight director annunciator to illuminate.

- Note that after four seconds the attitude displays on the EADI and the MFD are removed from view and that all flags associated with the EADI and EHSI are in view.

Release the pilot's EFIS ground test button.

- Note that instrument displays return to normal.

- Note that PIT, ROL, and HDG messages are still in view.

Depress the comparator warning reset button, and note that PIT, ROL, and HDG messages disappear from view and the comparator circuit is reset.

Repeat test for the copilot's EFIS ground test:

- Note that 10° are added to the current values of pitch and roll and 20° is added to heading with a negative increment to the copilot's side.

- Note that the word "TEST" in red appears on the EADI and MFD and that the comparator logic causes flashing PIT (pitch), ROL (roll), and HDG (heading) comparator warning messages to show on the EADI and MFD and the comparator warning on the flight director annunciator to illuminate.

- Note that after four seconds the attitude displays on the EADI and the MFD are removed from view and that all flags associated with the EADI and EHSI are in view.

Release the copilot's EFIS ground test button.

- Note that instrument displays return to normal.

- Note that PIT, ROL, and HDG messages are still in view.

Depress comparator warning reset button, and note that PIT, ROL, and HDG messages disappear from view and the comparator circuit is reset.

* b. Autopilot and Electric Trim..... TEST

Check for full free movement of controls.

Push control column forward to overpower the elevator servo, and check that the elevator trim wheel rotates in pulses to apply noseup trim; the elevator trim indicator moves aft.

Pull the control column back, and check that the elevator trim wheel rotates in pulses to apply elevator trim; ELEV MISTRIM warning illuminates (see note below).

CAUTION

Do not permit autopilot to drive primary controls of elevator trim onto stops.

NOTE

Autopilot must not be used in flight if auto trim is unserviceable.

Rotate clockwise, and check that the aileron trim indicator rotates counterclockwise; AIL mistrim–warning illuminates (for aircraft equipped with aileron trim indicator). Rotate counterclockwise, and check that the aileron trim indicator rotates clockwise; AIL mistrim–warning illuminates.

Check each AP DISC button and that the engage lever disconnects the autopilot. Check AP annunciator and audio warning.

Check that the autopilot disengages; cancel warning.

Autopilot disconnects, and V bars give 12° noseup pitch command and wings level.

Check that the AP DISC button disengages the yaw damper.

Operate each switch on both control columns in turn in both directions and check that the trim runs in the appropriate direction. Then raise the guard and operate each half of both switches in turn, making sure that there is no movement of the trim wheel. If the trim wheel does move, the system is unserviceable and should be isolated by pulling the electric trim circuit breaker (Check MEL.)

* c. EFD (EFIS)..... TEST

* d. CAT 2 ..... CHECK/AS REQUIRED

* e. FDR..... SET

* f. Flight Instruments..... CHECK

Check each instrument with its individual test button:

- On the airspeed indicator, the needle and the barber pole go to 335 for two seconds and then to zero with a flag.
- The altimeter goes to 750 feet with a flag.
- The VSI goes to +6,000 feet with a flag.

† 30. Glareshield Panels ..... CHECK/SET

Check pilots and copilots display panels. Set format and course selections as desired.

31. Altitude Alert ..... TEST

Honeywell Avionics:

- Select “0” feet with ALT select knob, and then return to initial departure altitude. Audible altitude alert tone should sound.

Collins Avionics:

- Test by pressing and holding the ALT ALERT switchlight on the preselector

32. Master Warning System..... CHECK/SET

Test by pressing MWS TEST button and observing that all annunciators illuminate on the main panel, overhead panel, and center pedestal.

Test by adjusting the annunciator lights to full dim. Place DIM OVRD switch to the DIM OVRD position, and observe the illumination of all annunciators increase to full bright. Return the DIM OVRD switch to the DIM OVRD position, and adjust the annunciator lights to the desired level.

† 33. Fuel Quantity ..... CHECK

† 34. Fuel Flow ..... ZERO/RESET COUNTERS

35. Engine Instruments ..... CHECK

Set bugs on N_1 and ITT gages as appropriate.

* 36. Pitch Trim ..... SET FOR TAKEOFF

37. Nose Gear Mechanical Indicator..... EXTENDED

38. Dump Valve ..... CLOSED

† 39. Cabin Controller..... SET RATE AND ALTITUDE

* 40. Smoke Detector..... TEST

41. Manual Pressure Control ..... FULL DECREASE

NOTE

The knob should be closed to full decrease (only finger tight).

42. Ground Test Valve ..... NORMAL

* 43. Standby Gear Indicator Lights ..... ON

44. Pitot Isolation Valve ..... NORMAL

45. Battery and Fuel Temperature ..... CHECK

† 46. Airbrake Handle ..... FORWARD

Airbrake indicator usually shows that they are open due to lack of hydraulic pressure.

† 47. Flaps ..... SET

NOTE

If the flaps are in a position other than up, place the flap selector in the position, which matches the flap position. This will avoid unnecessary loads on the starter and hydraulic pump during the first engine start.

† 48. HP Cocks ..... CLOSED

† 49. LP Cocks ..... OPEN

† 50. Wing X-Feed and Transfer Handle ..... CLOSED/LIGHT OUT

† 51. Auxiliary Fuel Transfer Handle ..... CLOSED/LIGHT OUT

NOTE

With the pump handle not fully down, the gear might not retract after takeoff. Also check that the handle extension is stowed in its clips on the front of the copilot's seat. This handle also functions as the rudder control lock.

† 52. Emergency Hydraulic Pump Handle ..... DOWN/STOWED

*†53. ATIS Information/Clearance ..... RECORDED

* 54. FLT SYS/NAVs/Radios/Radar ..... PROGRAMMED/SET

The flight system normally should be set on the pilot's side to NAV 1 and VOR 1 while the copilot's should be set to NAV 2 and VOR 2.

All NAV systems and radios should be tuned and identified for the intended departure, long-range NAV systems should be programmed. Set the radar to standby.

† 55. Takeoff Data ..... COMPUTED/POSTED

* 56. Radio Masters/EFIS (1 and 2)..... AS REQUIRED

For an APU start, the radio masters may remain on. The radio masters should be off for a GPU start to protect the radios from a voltage spike.

57. Before Starting Engines Checklist ..... COMPLETE

STARTING ENGINES CHECKLIST

EXTERNAL, APU, OR BATTERY

1. Beacon ..... ON

2. Engine Computers..... AUTO/LIGHTS OUT

3. Fuel Pumps No. 1 and No. 2 ..... ON/LIGHTS OUT

Two lights, FUEL 1 LO PRESS and FUEL 2 LO PRESS, are illuminated on the overhead; the third light, FUEL1 ↑, is illuminated on the main annunciator panel.

NOTE

During a battery start, the fuel low pressure lights will remain illuminated until the start power switch is depressed.

4. External Battery Charge Switch..... OFF

NOTE

Start power will not be available if the EXT BATT CHG switch is left on.

5. Start Power Switch..... PRESS/LIGHT ON

6. Engine No. 2 Starter..... PRESS/LIGHT ON

Press, light illuminates green and release.

a. HP Cock..... OPEN AT 10% N_2 PLUS N_1 INDICATION

Check the N_2 rpm is increasing to at least 10% to 12%.

Select HP COCK 2 to ON at the first indication of N_1 acceleration. It is important that the N_1 rotor is confirmed to be rotating before the HP cock selected is ON.

b. ITT..... INCREASE WITHIN 10 SECONDS

c. N_1 RPM ..... ROTATION BY 20% N_2

d. Oil Pressure Light..... OUT BY GROUND IDLE

e. Hydraulic Pressure Light ..... OUT

f. Hydraulic Pressure ..... 3,000 PSI

At this point the airbrake indicator should be showing SHUT.

g. Starter Operate Light ..... OUT BY 46% N_2

If the light fails to go out, it indicates that the starter has failed to automatically convert to a generator. The starter is deenergized by pressing the START PWR button, which should cause the white START PWR and green start OPERATING lights to extinguish. Start power can then be reengaged for a subsequent start, if necessary.

h. Fuel Flow..... CHECK NORMAL

7. Engine No. 1 Start ..... REPEAT AS FOR ENGINE NO. 2

8. Starting Engines Checklist ..... COMPLETE

NOTE

Before restarting an engine after it has been static for 5–45 minutes, ensure the N_1 rotor is free.

CAUTION

Do not attempt a restart until indicated ITT is less than 200°C.

Abort if:

- There is no indication of N_1 by 20% N_2.
- ITT rapidly approaches 974°C.
- N_1 or N_2 stops increasing before reaching idle rpm.

- Oil pressure light is still on at ground idle.

FAILURE TO START CHECKLIST

1. HP Cock ..... CLOSED

2. Start Power Switch ..... PUSH TO ABORT/LIGHT OUT

Wait three minutes to allow fuel to drain, or motor engine for 15 seconds.

3. Failure to Start Checklist .....COMPLETE

CAUTION

Do not attempt a restart until indicated ITT is less than 200°C.

AFTER START CHECKLIST

1. Start Power Switch ..... OFF

   The light should be extinguished.

2. External Power Switch..... OFF/DISCONNECT

   Instruct the ground crews to disconnect the ground power unit if used for start.

3. Generator Fail Lights ..... OUT

   If the lights are not out, the generators may be brought on line manually.

4. APU Generator ..... TRIP

   Trip in order to check output of engine-driven generators.

5. Bus Tie..... OPEN

   Check DC power annunciators all off except bus tie open.

   PS1, PS2 and PE volts ..... CHECK/28 VOLTS

   BATT AMPS..... CHECK

   Use 0–40 button if charge rate is below 40 amps. If either battery is not charging, place the BATT switch OFF, and shut down engines.

6. Main Generators ..... CHECK VOLTS AND AMPS

7. Bus Tie ..... CLOSED/LIGHT OUT

8. Main Generator Amps ..... PARALLEL

NOTE

Radio masters/EFIS (1 and 2) should be turned back on if they had been turned off prior to GPU start.

9. Alternators ..... ON/LIGHTS OUT

10. Windshield Heat ..... ON

11. Pitot Vane Heat ..... ON

12. Engine Anti-ice .....CHECKED (AS REQUIRED)

NOTE

Power above idle may be required for the following check:

Select both ENG ANTI-ICE switches to the on position. Note that both ENG A/ICE annunciators illuminate dimly for two seconds and then extinguish. Note a small increase in each engine N_1, and note that the ICE PROT SELECTED annunciator is illuminated. Select both switches off. Note a decrease in N_1 and that all associated annunciators are extinguished.

13. Seats and Harnesses ..... SECURE

14. DV Windows ..... SHUT

NOTE

After a battery start, complete * items on the Before Start Checklist prior to starting taxi.

WARNING

Do not move aircraft until AHRS/IRS are aligned and operational.

15. After Start Checklist ..... COMPLETE

TAXI CHECKLIST

1. Thrust Reversers ..... ARMED

2. Brakes and Steering ..... CHECKED

   Check that the handwheel is clear and the index mark is forward. Confirm proper response for directional control.

   With the wheel brake lever in PARK, check that the normal brake indicators show 1,750 to 1,950 psi and both brake annunciator lights are on.

   Apply maximum toe brake pressure, and release the wheel brake lever to normal.

   Check that both emergency brake annunciator lights go out as the lever passes through the emergency position. The normal brake indicator should continue to indicate 1,750 to 1,900 psi.

   After commencing taxi, check that the brake pedals give normal braking.

3. Airbrakes ..... SHUT

4. Flaps ..... SET FOR TAKEOFF

   Normal flap position for takeoff will be 15°.

5. Trims ..... SET

6. Flight Controls ..... CHECKED

   Exercise the flight controls to full deflection in each direction.

   The pilot exercises the rudder and the copilot the ailerons and the elevator.

   Completing this check, each pilot announces “Checked.”

7. Altimeters ..... SET

   Each pilot states and sets the current altimeter setting in his altimeter, noting the reading of the instrument. The copilot also sets the standby altimeter.

8. Taxi Checklist ..... COMPLETE

BEFORE TAKEOFF CHECKLIST

1. Engine Computer/Rudder Bias/Thrust Reversers..... CHECKED/ON

   Both engine computers and rudder bias systems must be operative. The following check must be performed prior to the first flight of the day. It is the manufacturers recommendation that these checks be performed together. If preferred they may be completed independently.

   With the throttles at idle, check LH and RH thrust reverser ARM annunciators are illuminated, then select the engine computers to OFF, one at a time, while observing engine limitations. Be prepared to select AUTO or to close the HP cock if engine control is lost, or any abnormal response is noted.

   Check that ENG 1 CMPTER and ENG 2 CMPTER annunciators illuminate.

   Turn off both RUDDER BIAS switches; observe that the RUDDER BIAS annunciator illuminates.

   Advance the RH thrust lever to indicate approximately 80% N_2. Select the RUDDER BIAS switches to ON and then OFF in turn; observe that the right rudder pedal moves forward with each ON selection. Select both RUDDER BIAS switches to on, then LH T/R lever to deploy. Check rudder bias is inhibited, LH UNLCK and REVRS annunciators illuminate. MWS REVERSER annunciator does not illuminate.

   LH T/R lever to stow. Check that the rudder bias is felt, LH UNLK and REVRS annunicators are extinguished, and the LH ARM annunciator illuminates.

   Repeat the above procedure for the LH engine, noting that now the left rudder pedal moves forward with each rudder bias selection.

   Select the RUDDER BIAS switches to ON and guarded; observe that the RUDDER BIAS annunciator light extinguishes.

   Select the engine computers to AUTO. Observe that the ENG 1 CMPTR and ENG 2 CMPTR annunciators extinguish.

2. APR ..... CHECK

   Depress the APR ARM selector switch. Note that the white annunciator illuminates.

   Advance either power lever to approximately a 5% N_2 difference from the other engine. Note that the green APR annunciator illuminates and N_2 increases 1% on both engines.

Return the power lever to idle, and depress the APR ARM selector to disarm the system. Note that the annunciator lights are extinguished and a 1% drop in No. 1 and No. 2 engine N_2 rpm.

3. Flight Deck Heat ..... CLOSE

4. Main Air Valves ..... CLOSE

5. APU Bleed-Air Valve Switch..... AS REQUIRED

6. APU ..... AS REQUIRED

If stopping the APU, push the overspeed test button momentarily to stop the APU and check the system shutdown operation.

Confirm the APU GEN FAIL annunciator comes on, otherwise the APU generator could motor the APU after shutdown.

APU Master Switch..... OFF

CAUTION

The APU MASTER switch must not be left in the ON position with the APU not running.

APU fuel pump cavitation can occur with subsequent damage or failure.

7. FLT SYST/NAVs/Radios/Compass/FMS..... SET/CHECKED

Flight guidance panels and NAV 1 and NAV 2 should be tuned and set for departure, the compasses should agree with each other, and flight management systems should be ready for departure.

8. Takeoff Briefing ..... COMPLETE

9. Battery Temperatures ..... CHECK ABOVE –10°C

10. Battery Amps..... BELOW 20 AMPS

Operate the PUSH BATT AMPS button.

NOTE

The aircraft should not take off if either battery is being recharged at more than 20 amps. If necessary, delay departure and monitor battery amps until charge rate is less than 20 amps.

12. FMS ..... AS REQUIRED

13. Before Takeoff Checklist ..... COMPLETE

LINEUP CHECKLIST

1. Transponder ..... ON

2. Engine Ignition ..... AS REQUIRED

   Ignition is recommended for all takeoffs. It is required if the runway is wet.

3. Ice Protection ..... AS REQUIRED

   This refers to both airframe and engine anti-icing. When required, set the WING/TAIL ANTICE time switch to 10 minutes (maximum). The ENG ANTICE switch should be on, ENG 1 and ENG 2 A/ICE annunciators off, and ICE PROT SELECTED annunciator on MWS panel illuminated.

4. FATS ..... CHECKED

---

5. Exterior Lights ..... AS REQUIRED

   Taxi lights are suggested for all departures; landing lights may be turned on depending on weather and lighting conditions. Strobe lights should be turned on or, when equipped, selected to AUTO (which would cause strobes to come on at lift-off and go off at touchdown).

6. MWS ..... CHECK/CONSIDERED

   The master warning panel should be clear at this time, except when engine anti-ice is on, in which case the ICE PROT SELECTED annunciator would be illuminated.

7. APR ..... ARMED

   Fully open both throttles, confirm N_1 REF is equaled or exceeded and then ARM APR (white light on).

   Verify that the APR ARMED light (white) only is illuminated. If the green APR light is illuminated, the APR system has been activated.

IMMEDIATE RETURN/TRAFFIC PATTERN CHECKLIST

NOTE

This checklist may be used in lieu of Climb, Cruise, Decent, and In-Range Checklist for immediate return after takeoff. (Do not use this checklist if the After Takeoff and Climb Checklist has been accomplished.)

1. Landing Gear ..... UP
2. Main Air Valves ..... AS REQUIRED
3. Yaw Damper ..... ENGAGE
4. Flaps ..... UP
5. APR ..... AS REQUIRED

---

6. Ice Protection ..... AS REQUIRED
7. Ignition ..... AS REQUIRED
8. NAVs and Radios ..... SET
9. V_{REF} ..... SET
10. Crew Briefing ..... COMPLETED

AFTER TAKEOFF AND CLIMB CHECKLIST

1. Landing Gear ..... UP

   All landing gear lights should extinguish.

2. Main Air Valves ..... OPEN

   Main air valves may be left closed depending on the reason for the immediate return, e.g., engine failure.

3. Yaw Damper ..... ENGAGE
4. Flaps ..... UP

Upon reaching a minimum airspeed of V_{FTO}, assuming that both engines are operating.

5. APR ..... DISARM

Disarm APR when clear of obstacles and a minimum airspeed of V_{FTO} has been attained.

APR should be left on if the system was activated due to an engine failure.

---

6. Ice Protection ..... AS REQUIRED

Airframe and engine anti-icing systems should be selected according to the weather conditions. If weather does not require operation of the airframe anti-ice system, prime the system for 30 seconds.

7. Ignition ..... AS REQUIRED

On if required by weather conditions.

8. Engine Synchronizer ..... N_1 OR N_2

9. Landing Lights ..... OFF

10. Cabin Notices ..... AS REQUIRED

11. Engine Instruments ..... NORMAL

12. Pressurization ..... SET

Verify on the cabin altitude and cabin rate indicators that the airplane has pressurized.

13. Oxygen ..... CHECKED

14. Altimeters ..... SET AT T.A.

Transition altitude is a standard 18,000 feet in the USA. Elsewhere in the world, it varies.

15. Taxi Lights ..... OFF AT 18,000 FEET

16. Fuel X-Feed and Auxiliary Tanks ..... AS REQUIRED

Maintain a lateral balance of 500 pounds at all times. Transfer fuel from the ventral tank when the main tanks reach 3,300 pounds each.

17. After Takeoff and Climb Checklist ..... COMPLETE

CRUISE CHECKLIST

1. Power ..... SET

   With the synchronizer engaged, adjust the power levers so the N_1 does not exceed the limits specified for the existing OAT and flight level, as shown on the maximum cruise N_1 chart. Observe the maximum N_2 limit of 100%. Do not exceed V_{MO}/M_{MO} limits appropriate for the fuel configuration.

2. Pressurization ..... CHECK

3. Engine Instruments ..... CHECK

4. Auxiliary and Wing Fuel Tanks..... AS REQUIRED/BALANCED

   Start the fuel transfer as soon as the indicated contents of each wing is down to 3,300 pounds. Move the auxiliary fuel transfer lever to the transfer (down) position. Check that the auxiliary fuel transfer annunciator illuminates (this indicates lever position only). After a slight delay, an indication that fuel transfer is taking place is given by the ventral tank indicator showing “cross-hatched” combined with a slow increase of wing fuel contents. With both fuel pumps operating, transfer takes 11 to 12 minutes. Maintain lateral balance of fuel within 500 pounds at all times.

5. Cruise Checklist ..... COMPLETE

DESCENT AND IN-RANGE CHECKLIST

1. Main Air Valves ..... OPEN

2. Ice Protection ..... AS REQUIRED

   a. If entering icing conditions ..... STEP 3

      Ignition is incorporated into this procedure.

b. If icing conditions are expected or known to exist, complete the following:

(1) ENGINE IGNITION 1 Switch ..... ON

(2) ENGINE ANTICE 1 Switch ..... ON

Observe the illumination of the ICE PROT SELECTED annunciator.

(3) Wing and Tail Anti-ice .....SET FOR 10 MINUTES

NOTE

The selection should be made two minutes prior to entering icing conditions.

(3) Airspeed ..... ADJUST

Adjust to 230 knots or .63 Mach.

(4) ENGINE IGNITION 2 Switch ..... ON

(5) ENGINE ANTICE 2 Switch ..... ON

(6) Engine Anti-ice Annunciators ..... EXTINGUISHED

Monitor during flight; if an annunciator illuminates, increase N_1 by 5%.

3. Ignition ..... AS REQUIRED

4. Fuel ..... CHECK WEIGHT/BALANCE WINGS

5. ATIS ..... RECEIVED

6. Landing Data/V_{REF} ..... COMPUTED

7. Pressurization ..... SET FOR LANDING

At the start of the decent, set the pressure controller cabin altitude pointer to 1,500 feet above destination airfield altitude. The selected rate should not exceed 300 feet per minute. For normal descents, flight idle engine rpm may be used (if engine anti-ice is not needed). The cabin altitude setting for landing depends on the destination airfield barometric altimeter setting. Apply the setting correction given in the following table to the airfield elevation; then set the pressure controller cabin altitude pointer to that value.

8. Taxi Lights..... ON AT 18,000 FEET

9. Altimeters.....SET AT T.L.

NOTE

Items below this line are to be accomplished just prior to the approach portion of the flight.

---

10. Approach Briefing.....COMPLETE

    The typical approach and landing briefing should state the type of approach, landing runway, runway length, field elevation, MDA or DH, FAF location and altitude, minimum safe altitude, and the missed approach procedure. The primary and backup NAV aids should be stated. Calls should be requested for the FAF inbound, flag check on instruments, 1,000, 500, and 100 feet above minimums, minimums, and runway in sight. Additional information, such as runway conditions, other unusual conditions, a request for questions, and any additional briefing, as required, should also be provided.

11. Wing X-Feed and Transfer..... CLOSE/LIGHT OUT

12. Cabin Notices..... ON/AUTO

13. Flight Deck Heat..... CLOSE

    This valve must be closed at this point in the flight to ensure maximum power would be available in the event of a go-around.

14. NAV, Radios, and Display Panel..... SET

    Check that all NAVs, radios, courses, and descent altitudes are set and programmed correctly for the approach.

15. Seats and Harnesses.....SECURE

16. Descent and In-Range Checklist.....COMPLETE

BEFORE LANDING CHECKLIST

1. Airbrakes..... SHUT

2. Flaps..... 15°

3. Nosewheel Steering..... CLEAR

4. Engine Ignition..... AS REQUIRED

5. Engine Synchronizer ..... OFF

6. Landing Gear ..... DOWN, THREE GREEN LIGHTS

7. Nosewheel Steering ..... CENTERED

8. Flaps..... AS REQUIRED

   The type of approach being flown determines the flap settings. It is recommended that all landings be made with 45° flaps.

9. Landing Lights ..... AS REQUIRED

10. Before Landing Checklist..... COMPLETED

CLOSE IN CHECKLIST

1. Landing Gear ..... RECHECK

2. Main Air Valves ..... CLOSE

   Air valves must be closed before reaching 250 feet AGL to ensure that maximum power is available in the event of a missed approach.

3. Autopilot/Yaw Damper..... DISENGAGE

   The yaw damper must be disengaged before touchdown.

MISSED APPROACH CHECKLIST

In case of a missed approach, refer to the After Takeoff and Climb, or Immediate Return/Traffic Pattern Checklist.

AFTER LANDING CHECKLIST

1. Exterior Lights..... SET

   Landing lights should be switched off or to taxi as soon as practical after landing to prevent heat damage to the lens that covers the landing lights. Strobe lights should also be turned off.

2. Screen Heat, Pitot Heat, and Engine Ignition ..... OFF

3. Transponder and Radar ..... STANDBY

4. Ice Protection ..... AS REQUIRED

   Engine anti-icing should be left on if taxiing in icing conditions.

5. Airbrakes and Flaps..... SHUT AND UP

   Shut the airbrakes first. This will remove the balk on the flaps so that they can be retracted.

6. APU ..... AS REQUIRED

   Start the APU if needed for air conditioning and/or electrical power.

7. Air Conditioning ..... AS REQUIRED

8. After Landing Checklist ..... COMPLETE

SHUTDOWN CHECKLIST

1. Taxi Lights ..... OFF

2. Parking Brake ..... SET

   Check the brake indicators to verify that pressure is applied to the brakes.

3. EFIS/Radios/Radar/Standby Horizon ..... OFF

4. Alternators..... OFF

5. Ice Protection ..... OFF

6. Thrust Reversers and Power Switches ..... OFF

7. BATT No. 1 and No. 2 Temperatures ..... CHECKED

8. HP Cocks ..... CLOSED

9. Fuel Pumps 1 and 2..... OFF

10. Engine Computers..... OFF

11. Cabin Notices..... OFF

12. Generator Fail Lights..... ON

13. APU Bleed-Air Switch ..... OFF

14. Inverters ..... OFF

15. Oxygen ..... AS REQUIRED

    Both the main and passenger oxygen valves should be closed for extended ground time, but may be left open for shorter periods of time.

16. APU Generator ..... TRIP

17. APU ..... SHUTDOWN

18. Beacon ..... OFF

19. Exterior Lights ..... OFF

20. Cabin Emergency Lights ..... OFF

21. Battery Switch ..... OFF

    Before turning off the battery switch, check that the voltmeter selector is not selected to read battery voltage on any of the batteries, as these positions are hot wired, and will deplete the batteries if left in these positions.

22. Parking Brake ..... OFF

    Release the brakes after the aircraft has been chocked.

23. Shutdown Checklist ..... COMPLETE

THRU FLIGHT INSPECTION

1. Wheels/Tires/Brakes ..... CHECKED

2. Gear Pins ..... REMOVED

3. Nose Steering Pins (2) ..... INSTALLED

4. Nose Gear Doors ..... CLOSED AND LOCKED

5. Access Caps and Doors ..... SECURE

6. Engine Intakes ..... CLEAR

7. Aircraft Walkaround ..... GENERAL CONDITION
8. Interior Cabin ..... CHECKED, SECURE
9. Thru Flight..... COMPLETE

SECURING CHECKLIST

1. Control Locks..... AS REQUIRED
2. Pins/Plugs/Covers..... AS REQUIRED
3. Aircraft Walkaround..... CONDITION
4. Engine Oil Level..... CHECKED
5. Filter Bypass Pin ..... NOT EXTENDED
6. Chocks..... AS REQUIRED
7. Aircraft Secured ..... AS REQUIRED
8. Securing Checklist..... COMPLETE

ABNORMAL PROCEDURES

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ABNORMAL PROCEDURES

INTRODUCTION

The procedures contained in this section have been developed and recommended by the manufacturer for use in the operation of this airplane. These procedures are for guidance only in identifying acceptable operating procedures for abnormal conditions. An abnormal condition, in this context, is defined as an unusual situation in which immediate and precise action will substantially reduce the risk of degradation to the airplane operation.

Silencing of audible warnings will enhance crew coordination in the performance of abnormal procedures.

NOTE

In these procedures, it is assumed that the positions of the captain and first officer are as follows:

- Captain–Occupying the left crew seat
- First officer–Occupying the right crew seat

ANNUNCIATORS

Throughout the procedural sections of this *Airplane Flight Manual*, annunciators that are illuminated are depicted by the symbols shown below:



The hash sign (#) is used to indicate that two (or more) annunciators exist for a particular service or warning. Prior to initiating the actions required by the appropriate procedure, the crew must establish the exact source of the annunciated condition, e.g., ENG 1 FIRE or ENG 2 FIRE.

MWS annunciators located on the roof panel are shown on the left side of a page. Annunciators located on the main MWS panel are shown on the right side of a page.

The red master warning system flashers on the glareshield are not shown. It is expected that crewmembers are familiar with the need to push either of the flashers to acknowledge a new indication.

POWERPLANT

ENGINE RELIGHT

CAUTION

Relights should not be attempted if:

1. Engine failure is accompanied by symptoms of internal engine damage.

or

2. No indication of N_1.

IMMEDIATE RELIGHT

NOTE

This procedure may be used if flameout is detected quickly.

CAUTION

If N_2 falls below 15%, close the HP cock and complete the Normal Relight procedure.

1. ENG IGNITION ..... ON
2. Thrust Lever ..... CLOSE
3. Fuel Flow ..... OBSERVE STARTING FLOW
4. ITT ..... MONITOR

If relight unsuccessful (N_1 and N_2 rpm do not increase within 10 seconds)

or

ITT rapidly approaches 978°C:

5. HP COCK ..... CLOSE
6. ENG IGNITION ..... OFF

When engine has relit:

7. Thrust Lever ..... SET AS REQUIRED
8. ENG IGNITION ..... OFF

9. Engine Indications ..... NORMAL

10. GEN ..... CLOSE

11. BUS TIE (If Open) ..... CLOSE

If engine does not relight, carry out Engine Failure procedure.

WINDMILL RELIGHT

1. Airspeed and Altitude ..... WITHIN ENVELOPE SHOWN IN FIGURE AP-1

2. N_1 rpm ..... INDICATING

3. N_2 rpm ..... 10% OR MORE

4. HP COCK ..... CLOSE

5. LP COCK ..... OPEN

6. ENG ANTICE ..... OFF

7. Fuel PUMP ..... ON

8. ENG SYNC ..... OFF

9. MAIN AIR VLV ..... CLOSE

10. ENG IGNITION ..... ON

11. HP COCK ..... OPEN

12. Fuel Flow ..... OBSERVE STARTING FLOW

13. ITT ..... MONITOR

If light up does not occur within 10 seconds

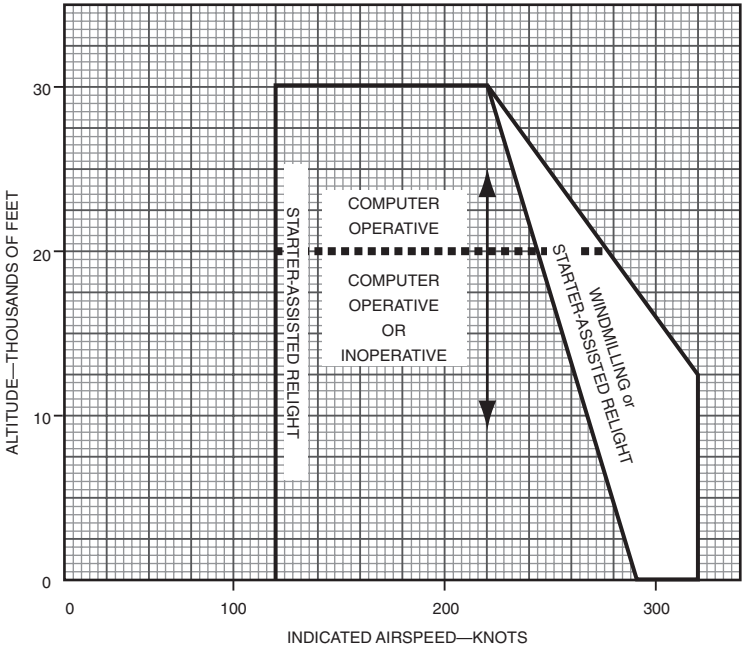
or

If ITT rapidly approaches 978°C

or

If no oil pressure indicated within 10 seconds of light up:

14. HP COCK ..... CLOSE



	STARTER-ASSISTED RELIGHT	WINDMILL RELIGHT
Engine Computer OPERATIVE	Complete envelope (including shaded area) available.	Complete shaded area of envelope available.
Engine Comptuer INOPERATIVE	Shaded and unshaded envelope below 20,000 feet available.	Shaded area of envelope below 20,000 feet available.

Figure AP-1. Engine Relight Envelope

If relight is unsuccessful, wait 10 seconds before making another attempt.

After start:

15. ENG IGNITION ..... OFF
16. GEN ..... CHECK ON LINE
17. BUS TIE (If Open) ..... CLOSE
18. Engine Indications ..... NORMAL
19. MAIN AIR VLV ..... OPEN
20. Thrust Lever ..... SET AS REQUIRED
21. ALTERNATOR ..... ON
22. ENG SYNC ..... AS REQUIRED
23. Wing Fuel XFEED/TRANSFER Lever ..... CLOSE WHEN FUEL BALANCED

STARTER-ASSISTED (NORMAL) RELIGHT

1. Airspeed and Altitude ..... WITHIN ENVELOPE SHOWN IN FIGURE AP-1
2. N_1 and N_2 rpm ..... BOTH INDICATING
3. HP COCK ..... CLOSE
4. LP COCK ..... OPEN
5. ENG ANTICE ..... OFF
6. Fuel PUMP ..... ON
7. ENG SYNC ..... OFF
8. MAIN AIR VLV ..... CLOSE
9. START PWR ..... PUSH, LIGHT ILLUMINATES
10. ENG Starter ..... PUSH, LIGHT ILLUMINATES
11. HP COCK ..... ON AT OR ABOVE 10% N_2

12. Fuel Flow..... OBSERVE STARTING FLOW

13. ITT..... MONITOR

If light up does not occur within 10 seconds

or

If ITT rapidly approaches 978°C

or

If no oil pressure indicated within 10 seconds of light up:

14. HP COCK..... CLOSE

15. START PWR Switch..... PUSH FOR ABORT

If relight is unsuccessful, wait 10 seconds before making another attempt.

After start:

16. ENG Starter..... LIGHT OUT ABOVE 45% N_2

17. START PWR..... OFF, LIGHT EXTINGUISHES

18. GEN..... CHECK ON LINE

19. BUS TIE (If Open)..... CLOSE

20. Engine Indications..... NORMAL

21. MAIN AIR VLV..... OPEN

22. Thrust Lever..... SET AS REQUIRED

23. ALTERNATOR..... ON

24. ENG SYNC..... AS REQUIRED

25. Wing Fuel XFEED/TRANSFER Lever..... CLOSE WHEN FUEL BALANCED

NOTE

It is recommended that windmill relights should not be attempted with the engine computer inoperative.

ENGINE COMPUTER FAILURE

ENG # CMPTR

NOTE

Engine synchronizer also disengages.

1. ENG CMPTR ..... OVSPD PROT

2. Thrust Lever ..... ADJUST TO KEEP REQUIRED RPM AND ITT (MONITOR LIMITATIONS)

If malfunction occurs during takeoff:

3. Below 80 KIAS ..... ABANDON TAKEOFF

4. Above 80 KIAS ..... CONTINUE TAKEOFF (KEEP ENGINE WITHIN $N_{1\ REF}$)

If malfunction occurs at maximum continuous power:

5. Thrust Lever ..... ADJUST TO ACHIEVE MAXIMUM CONTINUOUS ITT (968°C)

6. Engine Indications ..... MONITOR LIMITATIONS

ABNORMAL INDICATIONS OR BEHAVIOR

1. ITT or rpm above limits:

   a. Thrust Lever ..... CLOSE

If indications not controlled within limits:

   b. HP COCK ..... CLOSE

   Carry out Engine Failure procedure.

2. Rpm fluctuation or not controlled:

   a. Thrust Lever ..... MID-RANGE POSITION

   b. ENG CMPTR ..... OVSPD PROT

   c. Thrust Lever ..... ADJUST TO KEEP REQUIRED RPM (MONITOR ITT LIMITATIONS)

3. Oil temperature above limits:

   Carry out Engine Failure procedure.

   Note maximum temperature and duration.

HIGH ENGINE VIBRATION

If engine malfunction is confirmed or general vibration is present, carry out Engine Failure procedure.

If high engine vibration is suspected, carry out the following procedure on each engine, one at a time:

- Slowly retard the engine thrust lever to idle and monitor the engine instruments for any abnormalities. Note if there is any reduction in the vibration levels as the thrust lever is being retarded. Slowly move the thrust lever to its original position and note if there is any increase in vibration levels or if there are any abnormalities on the engine instruments.
- If it has been determined from this procedure that there are high levels of vibration from one of the engines, carry out the Engine Failure procedure on the affected engine.

THRUST REVERSER MALFUNCTIONS

RUDDER BIAS NOT INHIBITED



On the ground ***with*** thrust reverse selected.

1. Both Thrust Reverse Levers..... REVERSE IDLE

UNLOCK AND/OR ARM INDICATIONS IN FLIGHT



1. Associated POWER Switch(es) ..... OFF

AUTOSTOW



1. Associated POWER Switch(es) ..... OFF

   a. If indications normal ..... ENGINE MAY BE USED AS REQUIRED

   b. If indications persist ..... SELECT ENGINE TO IDLE AND LAND AS SOON AS PRACTICABLE

FUEL SYSTEM

FUEL LOW LEVEL

When the fuel contents of either wing tank are reduced to less than 320 pounds (150 kilograms), set the WING FUEL cock to X FEED.

A fuel quantity of at least 400 pounds (180 kilograms) is required to complete a go-around and subsequent circuit and landing. If fuel contents are reduced to below 400 pounds (180 kilograms), a go-around should not be attempted.

FUEL LOW PRESSURE



1. WING FUEL Cock ..... X FEED
2. FUEL LO PRESS Annunciator ..... CHECK NOT ILLUMINATED
3. Failed Fuel PUMP ..... OFF

Proceed as appropriate:

4. Ventral tank not empty:

   a. Use AUX FUEL TRANSFER cock selectively to maintain wing fuel balance within 500 pounds (227 kilograms).

5. Ventral tank empty:

   a. Select WING FUEL cock alternately to X FEED and TRANSFER to keep wing fuel contents balanced within 500 pounds (227 kilograms).

AUXILIARY FUEL TRANSFER FAILURE

VENTRAL TANK indicator does not change from FULL within two minutes of selecting AUX FUEL TRANSFER cock.

1. Wing FUEL Contents..... CHECK

Proceed as appropriate:

2. Wing contents increasing:

   a. Continue flight.

   b. Leave AUX FUEL TRANSFER cock open for 20 minutes plus an additional five minutes in cruise.

   c. If LO V_{MO} horn operates after this time, momentarily pull SPEED WARN relay circuit breaker (Panel DA-D B/8).

3. Wing contents decreasing:

   a. Continued flight is permitted, but land before the airplane weight goes below 22,500 pounds.

NOTE

Overweight landing procedure and inspection is required for any landing with fuel in the ventral tank.

ENGINE FUEL MALFUNCTION





1. Thrust Lever ..... REDUCE POWER OF AFFECTED ENGINE UNTIL THE WARNING IS CANCELLED, OR TO IDLE

If warning persists and is accompanied by engine malfunction, carry out Engine Failure procedure.

NOTE

The malfunction indicates either fuel filter blocked or fuel overheat.

AIR CONDITIONING/PRESSURIZATION

DUCT OVERHEAT



1. CABIN TEMP (If Installed) ..... FLT DK

2. CABIN TEMP Selector ..... MANUAL, HOLD FULL COOL

If warning ceases:

3. CABIN TEMP Selector ..... USE IN MANUAL MODE

NOTE

Temperature changes in manual mode should be made by short applications of the control. Allow sufficient time for each change to take effect.

If warning persists:

4. CABIN TEMP Selector ..... AUTO, FULL COOL

If warning persists:

5. MAIN AIR VLVs 1 and 2 ..... LP ON

Wait two minutes; If warning persists:

6. No. 2 Engine ..... INCREASE POWER TO A HIGH SETTING

7. MAIN AIR VLVs 1 and 2 ..... CLOSE

8. F/DK VLV ..... OPEN FULLY

NOTE

With the F/DK VLV open the hot bleed air can maintain a cabin altitude of approximately 9,000 feet at 40,000 feet aircraft altitude, assuming no abnormal leaks in the cabin. The temperature in the flight compartment and cabin will become high.

AUTOMATIC TEMPERATURE CONTROL FAILURE

1. CABIN TEMP (If Installed) ..... FLT DK

2. CABIN TEMP Selector ..... MANUAL, SELECT COOL OR HOT AS REQUIRED

NOTE

Temperature changes in manual mode should be made by short applications of the control. Allow sufficient time for each change to take effect.

If the manual temperature control is not effective, proceed as follows:

1. If the temperature is too low:

   a. MAIN AIR VLV No. 2 ..... LP ON

   b. F/DK VLV ..... OPEN AS REQUIRED

2. If the temperature is too high:

   a. MAIN AIR VLVs 1 and 2 ..... LP ON

FLIGHT DECK HEAT VALVE STUCK OPEN

Air-conditioning noise and warm incoming air with F/DK VLV selected CLOSE:

1. F/DK VLV ..... OPEN, THEN CLOSE

If flight deck valve remains open:

2. MAIN AIR VLV 2 ..... LP ON

MAIN AIR VALVE NOT IN SELECTED POSITION



Airplane in flight:

1. Relevant MAIN AIR VLV ..... CLOSE, THEN OPEN

If warning recurs:

2. Relevant MAIN AIR VLV ..... CLOSE

Airplane on ground:

Annunciator will illuminate whenever the MAIN AIR VLV is OPEN. If the annunciator is illuminated with MAIN AIR VLV selected CLOSE, have fault rectified before takeoff.

AUTOMATIC PRESSURE CONTROL FAILURE

1. Cabin altitude rising (cabin pressure decreasing) or cabin altitude fluctuating (cabin pressure oscillating):

   a. Altitude ..... 35,000 FEET OR BELOW

   b. No. 2 Engine..... SET HIGH POWER

   c. MAIN AIR VLV 2..... CLOSE

   d. F/DK VLV..... OPEN FULLY (SEE NOTE)

   e. MAIN AIR VLV 1..... CLOSE

   f. Cabin Altitude..... CHECK

      (1) If approximately 8,000 feet ..... CONTINUE FLIGHT

      (2) If rising rapidly toward or above 15,000 feet ..... CARRY OUT EMERGENCY DESCENT

If pressurization system not controlling:

   g. MAIN AIR VLVs 1 and 2..... OPEN

   h. F/DK VLV ..... CLOSE

Carry out the following procedure 2.

2. Cabin altitude decreasing (cabin pressure increasing) or if previous procedure is ineffective:

   a. MANUAL CABIN ALTITUDE CONTROL..... SLOWLY TURN TOWARD INCREASE UNTIL CABIN ALTITUDE INCREASES SLIGHTLY

   b. GROUND PRESS TEST VALVE ..... GROUND TEST

   c. MANUAL CABIN ALTITUDE CONTROL..... CONTROL AS NECESSARY

NOTE

Flight compartment and cabin temperature may become hot with the F/DK VLV fully open.

FAILURE TO PRESSURIZE

1. DUMP VALVE ..... CHECK SHUT
2. PRESSN Switch ..... OVRD

ELECTRICAL SYSTEM

SINGLE GENERATOR FAILURE





1. Failed GEN ..... TRIP
2. BUS TIE (If Open) ..... CLOSE
3. GEN AMPS (Operative Unit) ..... CHECK

   If above limit, reduce nonessential loads.

NOTE

It is recommended that no attempt should be made to reinstate the failed generator.

If it is considered necessary, then making only one attempt, the following procedure should be used:

4. BUS TIE ..... OPEN
5. Applicable GEN Switch ..... CLOSE AND HOLD FOR FIVE SECONDS

If this is unsuccessful:

6. GEN ..... TRIP
7. BUS TIE ..... CLOSE

BUS TIE OPEN





Voltage high (above 29.5) or low (below 24.5):

1. DC VOLTS ..... CHECK PS1 AND PS2 (IDENTIFY AFFECTED GENERATOR)
2. GEN (Abnormal Side) ..... TRIP
3. BUS TIE ..... CLOSE
4. GEN AMPS (Operative Unit)..... CHECK (IF ABOVE LIMIT, REDUCE NONESSENTIAL LOADS

ABNORMAL ELECTRICAL INDICATIONS

If the current or voltage is fluctuating, proceed as follows:

1. BUS TIE..... OPEN
2. GEN (Abnormal Side) ..... TRIP
3. BUS TIE ..... CLOSE
4. GEN AMPS (Operative Unit)..... CHECK (IF ABOVE LIMIT, REDUCE NONESSENTIAL LOADS)

GENERATORS OUT OF BALANCE

If generator differs by more than 40 amps

1. BUS TIE..... OPEN
2. GEN 1 and GEN 2 AMPS ..... CHECK EACH LESS THAN LIMIT
3. PS1 and PS2 Volts ..... CHECK EACH WITHIN 24.5 TO 29.5

If currents and voltages are normal:

4. BUS TIE ..... CLOSE

If an abnormality is observed proceed with 5 or 6 below, as applicable:

5. If one generator current is above limit ..... SHED NONESSENTIAL LOADS ON ABNORMAL SIDE

   If current cannot be reduced below the limit:

   a. Associated GEN ..... TRIP

   b. FUEL PUMP (Abnormal Side) ..... EMERG

NOTE

Do not close the bus tie.

6. One bus bar voltage is not between 24.5 to 29.5.

   a. Associated GEN ..... TRIP

   b. BUS TIE ..... CLOSE

BATTERY HOT (NICAD ONLY)





1. BATT HEATER Circuit Breaker (If Installed) ..... PULL

2. BATT ISOLATE ..... SELECT AFFECTED BATT

NOTE

BATT CNTCTR annunciator will illuminate.

BATTERY CONTACTOR





No in-flight action.

XS 1 OR XS 2 FAIL





Establish by use of the AC voltmeter whether supplies are available on the affected bus bar.

Proceed as appropriate:

1. Supplies not available:

   a. Proceed in this condition.

   b. Leave the inverter associated with the failed bus bar running.

1. Supplies available:

   a. No further action.

SINGLE INVERTER FAILURE





1. The following is applicable only if Leland static inverters P/N ASH664-1P or ASH664-1PF are installed through the incorporation of modifications 253135A or 253246A:

   WARNING

   Do not attempt to reset if INV 1 FAIL or INV 2 FAIL annunciators illuminate.

   NOTE

   Airplane may be operated in accordance with MMEL.

2. The following is applicable if other than Leland static inverters P/N ASH664-1P or ASH664-1PF are installed:

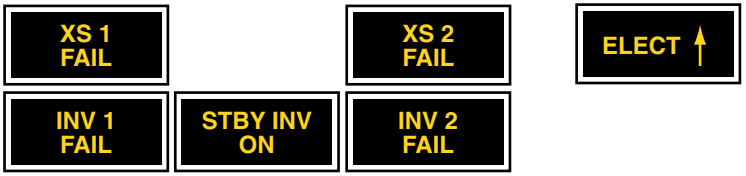
   a. Failed INV..... MOMENTARILY SELECT START

   b. If annunciator remains illuminated, no further action.

NOTE

Airplane may be operated in accordance with MMEL.

DOUBLE INVERTER FAILURE



1. The following is applicable only if Leland static inverter P/N ASH664-1P or ASH664-1PF are installed through the incorporation of modifications 253135A or 253246A:

WARNING

Do not attempt to reset if INV 1 FAIL or INV 2 FAIL annunciators illuminate.

NOTE

Airplane may be operated in accordance with MMEL.

2. The following is applicable if other than Leland static inverters P/N ASH664-1P or ASH664-1PF are installed:

   a. Failed INV ..... MOMENTARILY SELECT START

   b. If annunciator remains illuminated, no further action.

NOTE

Airplane may be operated in accordance with MMEL.

MWS DIMMER FAIL



1. MWS NORM/DIM OVRD Switch ..... DIM OVRD

FLYING CONTROLS

OUT-OF-TRIM WARNING

ELEV/AIL TRIM

1. If On Takeoff and Below 80 KIAS ..... ABANDON TAKEOFF
2. Thrust Levers ..... IDLE
3. Wheel Brakes ..... APPLY
4. AIR BRAKE ..... OPEN
5. Thrust Reverser (If Available) ..... SELECT

MACH TRIM FAIL

MACH TRIM FAIL

Restrict speed to Mach 0.73 or less unless autopilot is engaged.

RUDDER BIAS MALFUNCTION

Rudder bias gives unwanted rudder deflection when both engines are operating normally at the same N_2.

1. RUDDER BIAS (A/B) ..... OFF
2. RUDDER BIAS (A/B) ..... ON (IN TURN TO IDENTIFY FAULTY SYSTEM)
3. RUDDER BIAS (Faulty System) ..... OFF

STALL WARNING/STALL IDENTIFICATION

STALL IDENTIFICATION SYSTEM

Operation of the STALL IDENTIFICATION (stick push force) or STALL WARNING (stick shake) must be accepted as indicative of a stall. Proceed with normal stall recovery actions.

Take normal stall recovery action.

If stick push force or stick shake persists, proceed as appropriate:

1. Stick push force persists:

   a. STALL IDNT 1 and 2 ..... PUSH BOTH TOGETHER (SYSTEM IS NOW INHIBITED)

2. Stick shake persists:

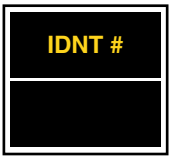
   a. Circuit Breakers:

      STALL WARN MOTOR L and R Panel DA-D: B/6, B/7 ..... PULL

NOTE

With stall identification system inhibited or stall warning system disabled, normal stall protection is not available. Continue flight with caution.

STALL IDENTIFICATION WARNINGS





1. Relevant IDNT Switch ..... PUSH (RELEVANT INHIB ANNUNCIATOR ILLUMINATES)

NOTE

Remaining channels of stall identification system will continue to provide stick pusher stall protection.

One of more of:



AND



No in-flight action.

CAUTION

System may be inoperative.

HYDRAULIC SYSTEM

MAIN HYDRAULIC FAILURE

HYD 1 LO PRESS

HYD 2 LO PRESS

Hydraulic supply pressure reduces to approximately 2,300 psi or below.

No immediate action necessary. Use of the auxiliary hydraulic system will be necessary to lower the landing gear and flaps before landing. Follow the appropriate procedures given below.

If EMER BRK LO PRESS annunciator is illuminated, refer to Emergency Brake Low Pressure procedure.

NOTE

Thrust reversers should be available for one deploy and one stow operation.

Landing Gear and Flaps Lowering

1. AUX HYD SYSTEM PULL Handle..... PULL, DO NOT RESET
2. Hand Pump..... OPERATE UNTIL GEAR LOCKS DOWN
3. LANDING GEAR Lever..... SELECT DOWN
4. FLAP Selector..... WHEN REQUIRED; SET TO DESIRED POSITION
5. Hand Pump..... OPERATE UNTIL DESIRED POSITION IS ACHIEVED

CAUTION

When operating the auxiliary hydraulic system to lower the landing gear, the hand pump action must be continued, after three greens are achieved, until positive resistance is felt to make sure the landing gear is down and locked.

NOTE

AIR BRAKE and LIFT DUMP inoperative.

Wheel Brake Operation

Before landing:

1. WHEEL BRAKE Lever:

   If SUPPLY Pressure Is Approximately 2,300 psi ..... LEAVE IN NORMAL (FORWARD) POSITION

   If SUPPLY Pressure Is Zero ..... SELECT EMERGY

2. Brake Pedals..... AVOID USE BEFORE LANDING

Actions on landing:

3. Brake Pedals ..... APPLY GENTLY (USE ONE CONTINUOUS APPLICATION IF POSSIBLE. DO NOT TAXI.)

NOTE

Nosewheel steering inoperative.

If normal braking fails:

4. Brake Pedals..... RELEASE

5. WHEEL BRAKE Lever ..... EMERGY

6. Brake Pedals ..... APPLY GENTLY (USE ONE CONTINUOUS APPLICATION IF POSSIBLE. DO NOT TAXI.)

EMERGENCY BRAKE LOW PRESSURE

MAIN HYDRAULIC FAILURE AND EMER BRK LO PRESS

Emergency brake system probably inoperative. On landing, use normal braking sparingly to conserve remaining pressure.

HYDRAULIC LOW PRESSURE



No in-flight action.

HYDRAULIC SYSTEM OVERHEAT



During Taxi (High Ambient Temperatures)

Cycle the flaps twice over the operating range. If warning is extinguished, continue taxi.

If warning remains, have fault rectified before flight.

During Flight

No inflight action.

HYDRAULIC AUXILIARY SYSTEM LOW FLUID LEVEL



AUX HYD LO LEVEL annunciator is illuminated whenever the auxiliary system is used.

LANDING GEAR

LANDING GEAR DOES NOT RETRACT

1. AUX HYD SYSTEM Hand Pump ..... CHECK SOCKET FULLY DOWN

2. AUX HYD SYSTEM PULL Handle ..... SET IN

If gear still fails to retract:

3. LANDING GEAR Lever ..... SELECT DOWN

4. Weight ..... IF NECESSARY, REDUCE AND LAND

LANDING GEAR LEVER CANNOT BE MOVED

If retraction is essential, these procedures must be done simultaneously:

1. BAULK OVRD Button ..... PUSH

2. LANDING GEAR Lever ..... SELECT UP

ICE AND RAIN PROTECTION

ENGINE ANTICE



1. Affected Engine ..... INCREASE N_1 BY 5%

Annunciator remains illuminated:

2. Avoid icing conditions if possible.

ANTICE LOW QUANTITY





Monitor anti-ice fluid quantity.

Approximately 30 minutes operation of the airframe anti-ice system is available when the warning illuminates.

ANTICE LOW PRESSURE





Avoid icing conditions. Airframe ice protection system has failed.

AIRFRAME ICE PROTECTION SYSTEM MALFUNCTION

If a malfunction is apparent or suspected during flight, proceed as follows:

1. Leave icing conditions as soon as possible.

2. Before starting the landing approach, observe the wing leading edge to determine if ice is present.

   a. If ice is present and atmospheric conditions permit, attempt to shed residual ice accumulations prior to landing.

      (1) If ice cannot be shed, make a flapless landing (refer to Flapless Landing in this chapter).

   b. If Ice Is Not Present ..... MAKE A NORMAL LANDING

PITOT HEATER FAILURE

PITOT HTR FAIL

ICE PROT

1. PITOT/VANE HEAT ..... CHECK LEFT AND RIGHT SWITCHES ON

If switched on:

2. PITOT AMPS ..... CHECK LEFT AND RIGHT AMPS TO IDENTIFY FAILED HEATER (CURRENT BELOW 1 AMP)

3. Associated Instruments ..... MONITOR

If discrepancies occur, the following equipment may fail to operate satisfactory:

- Left pitot heat failed:
  - Left air data computer and associated displays, overspeed warnings, 150 KIAS warning horn.
- Right pitot heat failed:
  - Right air data computer and associated displays, overspeed warnings, 150 KIAS warning horn, standby airspeed indicator.

CAUTION

Autopilot performance may be adversely affected.

The fault must be rectified before the next flight.

VANE HEATER FAILURE





No pilot action is required. However, when flying through icing conditions, extreme caution should be exercised.

NOTE

1. Accumulation of ice on the stall vanes may cause an intermittent stick shake.

2. The fault must be rectified before next flight.

WINDSCREEN OVERHEAT





1. Relevant SCREEN HEAT Switch..... OFF THEN ON

The warning will extinguish when the switch is turned off, but may recur either immediately or subsequently when the switch is turned on. Leave the switch on and continue in that condition if necessary.

The relevant screen will be controlled at a higher temperature than normal.

SIDESCREEN OVERHEAT





1. Left and Right SCREEN HEAT ..... OFF AND ON (ONE AT A TIME TO IDENTIFY THE OVERHEATING SCREEN)

NOTE

Left SCREEN HEAT switch controls left windscreen + right sidescreen.

Right SCREEN HEAT switch controls RH windscreen + LH sidescreen.

If any of the SCREEN OVHT or SIDESCRN OVHT warnings persist or are repeated, leave the relevant switch in the ON position.

WINDSCREEN DAMAGE

Cracks or other visible damage.

1. Relevant SCREEN HEAT ..... OFF

ALTERNATOR FAILURE





1. Appropriate ALTERNATOR ..... OFF THEN ON

Proceed as follows:

2. Warning Cancels ..... NO FURTHER ACTION

3. Warning Persists:

   ALTERNATOR ..... OFF

NOTE

Both windscreens (A panels) will remain heated but both sidescreens (B panels) will be unheated.

AUTOPILOT AND NAVIGATION—HONEYWELL AVIONICS

EFIS FAILURE

In the event of any failures, the airplane should be flown by the pilot who has the fully operational system, or the better system in the case of multiple failures. The pilot with the better system has control of the airplane.

If power to radio and/or EFIS systems has failed:

1. RADIO and/or EFIS MASTER BY PASS Toggle Breaker(s) ..... UP

For other EFIS failures:

2. Reversion Switching ..... SG, AHRS, ADC OR MFD MODES, AS APPROPRIATE

EFIS FAULTS

EFIS FAULT

And one of: EFIS OVHT, EFIS FAN FAIL, MFD OVHT, MFD FAN or NOSE FAN.

Proceed according to system affected:

EFIS or MFD OVHT:

1. Affected System..... MASTER SWITCH OFF
2. EFIS FAULT Annunciator ..... PUSH TO RESET

MFD FAN OR EFIS FAN FAIL

In flight:

1. No immediate action; monitor for EFIS or MFD OVHT.

On ground:

CAUTION

Power must be removed and remain off from the pilot's and copilot' EFIS and MFD system to prevent it from overheating during ground operations.

1. Affected System..... MASTER SWITCH OFF
2. EFIS FAULT Annunciator ..... PUSH TO RESET

NOSE FAN

On ground:

1. EFIS 1, EFIS 2, and MFD..... MASTER SWITCHES OFF
2. EFIS FAULT Annunciator ..... PUSH TO RESET

NOTE

Restore the EFIS and MFD master switchlights to on prior to takeoff. Ground operation of the EFIS and MFD is limited to 30 minutes.

AIR DATA COMPUTER

ADC # FAIL

1. Flight Guidance Panel HSI SEL ..... TO SIDE WITH OPERATIVE ADC
2. Altitude Preselector ..... SET/CHECK
3. Flight Director/Autopilot ..... AS REQUIRED
4. ADC Reversion Switch (Failed Side) ..... REV
5. ATC Transponder ..... SELECT TO OPERATIVE ADC

CAT 2 MALFUNCTIONS

Discontinue approach if:

- Any comparator monitor warning light illuminates
- GS, LOC, ATT, or FD flag on EADI
- HDG, GS, LOC 1, or LOC 2 flag on EHSI
- Mistrim annunciation (pilot's and copilot's annunciator panel)
- Autopilot malfunctions/disengagement below 1,000 feet radio altitude
- Amber CAT 2 annunciation

NAVIGATION PERFORMANCE DEGRADED

FMS Degraded (DGRAD)

The FMS DGRAD (amber) annunciator indicates the FMS cannot guarantee that the accuracy of the system meets the requirements for the current phase of flight. Except in the case of conducting an instrument approach procedure, the FMS may still be accurate and may be sued for navigation provided the flight crew can confirm the position through other means, such as cross checking the VOR/DME raw data.

FMS used for navigation:

1. Verify FMS Position ..... CROSS CHECK VOR/DME RAW DATA AND USE OTHER NAVIGATION SOURCES AS REQUIRED

FMS used for instrument approach:

2. FMS DGRAD Annunciator..... DISCONTINUE USE OF THE FMS FOR INSTRUMENT APPROACH GUIDANCE

FMS Dead Reckoning (DR)

The FMS DR (DR) is an alerting (amber) annunciator, and is lit when operating in the DR mode for longer than two minutes. The DR mode is defined as the loss of radio updating and all other position sensors.

FMS used for navigation:

1. FMS DR Annunciator ..... DO NOT USE FMS FOR NAVIGATION WITH FMS DR ANNUNCIATOR ILLUMINATED

AUTOPILOT AND NAVIGATION—COLLINS AVIONICS

AP TRIM WARNING



AND A OR E DISPLAYED IN YELLOW ON THE PFD

1. Move Appropriate Trim Wheel..... ZERO AP TRIM (AIL OR EL) INDICATOR

If mistrims are still present:

2. Autopilot..... DISCONNECT; ANTICIPATE HEAVY OUT-OF-TRIM LOADS

ELEVATOR FAIL WARNING



1. ELEVATOR TRIM Wheel ..... CHECK FREE

2. Move Trim Wheel..... ZERO AP TRIM EL INDICATOR

3. Autopilot ..... DISCONNECT

- If enroute, the autopilot may be reengaged and the flight continued.
- If the failure recurs, manual trimming will be necessary to keep the AP TRIM EL indicator at zero.
- If the failure occurs below 1,000 feet AGL, the autopilot should be disconnected.

EFIS FAILURES

In the event of any failures, the aircraft should be flown by the pilot who has the fully operational system, or the better system in the case of multiple failures.

Fail annunciation is displayed in red letters on the PFD. In the event of failure, unusable functions and the recommended action are presented in Table AP-1.

Table AP-1. EFIS FAILURE INDICATIONS

ANNUNCIATION	UNUSABLE FUNCTIONS	RECOMMENDED ACTIONS
DSP	All display functions controlled by DSP	Push DSP TRANSFER switch, (white ALTN is lit)
XDTA	On-side PFD and ND cannot display the following cross-side data: • Attitude • Heading • VOR • LOC • FMS • ADF • DME • GS	1. Continue with available sensors 2. Monitor standby attitude indicator NOTE DPU ALTN may not be available when required.
DPU FAIL	PFD and ND	Push DPU TRANSFER switch, (white ALTN is lit)

PFD Failure

Relevant TRANSFER Switches:

1. PFD | TO ND ..... PUSH; WHITE TO ND IS LIT

   If PFD (composite format) is displayed on ND, continue in this condition.

If PFD data is not displayed:

1. PFD | TO ND ..... PUSH; WHITE TO ND GOES OUT

2. DPU | ALTN ..... PRESS; WHITE ALTN IS LIT
ND DATA DISPLAYED ON MFD

ND FAILURE

If it is required to restore ND data information on to the MFD, proceed as 1 or 2 below:

1. TRANSFER ND | TO MFD Switch..... PUSH; WHITE TO MFD IS LIT

or

2. TRANSFER DPU | ALTN Switch ..... PUSH; WHITE ALTN IS LIT
ND DATA DISPLAYED ON MFD

Double DPU Failure

Following a failure of both PFDs and with both DPU | ALTN switches selected, normal conditions are:

- The captain's DSP controls the displays.
- No. 1 attitude and heading are shown together with No. 1 flight director mode indications.

Alternative Conditions

- No. 2 attitude and heading can be displayed by selecting the AHRS CAPT 1 switch.
- The displays can be controlled by the first officer's DSP after selection of the captain's TRANSFER DSP | ALTN switch.

Display Failures

It is not practicable to provide annunciation of every failure of processors or displays. Failures of this nature are characterized by illegible data or complete removal of the displays. If reversionary mode switching does not restore operation, the relevant display circuit breaker should be tripped.

Should both displays fail on the same side and selection of the appropriate DPU switch fails to restore normal operation, the relevant EFD MSTR should be selected off.

EFIS FAN FAIL Warning



No further action if enroute and not accompanied by an EFIS OVHT warning.

EFIS OVHT



EFIS equipment must not be operated continuously for longer than five minutes with an EFIS OVHT warning lit.

1. Warning on captain's panel:

   Isolate as follows:

   a. EFD ..... SWITCH OFF CAPTAIN'S EFD MSTR

   b. MFD ..... SWITCH OFF MFD MSTR

   c. MPU ..... PULL CIRCUIT BREAKERS

2. Warning on first officer's panel:

   Isolate right EFIS displays as follows:

   a. Switch off right EFD MSTR

3. Warning on both panels: Isolate all EFIS displays as follows:

   a. Switch off left EFD MSTR

   b. Switch off right EFD MSTR

   c. Switch off MFD MSTR

NOTE

Provided that the affected EFIS displays have been turned off for at least 30 minutes following an overheat warning they may be turned on again for the final approach and landing (five minute use maximum).

MISCELLANEOUS

ENTRY DOOR LOCKED



No in-flight action.

1. Door must be locked before takoff.

REAR BAY DOOR



In flight:

1. No action.

On ground:

2. Check rear bay door, refueling door, and toilet service door (if installed).

EMERGENCY LIGHTS NOT SELECTED (IF INSTALLED)



1. EMERG Lights ..... AUTO

EMERGENCY PROCEDURES

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EMERGENCY PROCEDURES

INTRODUCTION

The procedures contained in this section have been developed and recommended by the manufacturer for use in the operation of this airplane. These procedures are for guidance only in identifying acceptable operating procedures for emergency conditions. An emergency condition, in this context, is defined as a foreseeable unusual situation in which immediate and precise action will substantially reduce the risk of disaster.

Silencing of audible warnings will enhance crew coordination in the performance of Emergency Procedures.

NOTE

In these procedures, it is assumed that the positions of the Captain and First Officer are as follows:

- Captain–Occupying the left crew seat
- First officer–Occupying the right crew seat

MEMORY ITEMS

Actions to be memorized by the flight crew are enclosed in an outlined, shaded memory box.

ANNUNCIATORS

Throughout the procedural sections of this *Airplane Flight Manual*, annunciators which are illuminated, will be depicted as the symbols shown below:



The hash sign (#) is used to indicate that two (or more) annunciators exist for a particular service or warning. Prior to initiating the actions required by the appropriate procedure, the crew must establish the exact source of the annunciated condition, e.g., ENG 1 FIRE or ENG 2 FIRE.

MWS annunciators located on the roof panel are shown on the left side of a page. Annunciators located on the main MWS panel are shown on the right side of a page.

The red master warning system flashers on the glareshield are not shown. It is expected that crewmembers are familiar with the need to push either of the flashers to acknowledge a new indication and in certain cases to cancel audible warnings.

POWERPLANT

DOUBLE ENGINE FAILURE

1.	ENG IGNITION 1 and 2	ON
2.	Thrust Levers	CLOSE
3.	Crew Oxygen	DON MASKS IF ABOVE 15,000 FEET
4.	Engine Indications	MONITOR

If immediate relight is unsuccessful:

1.	HP COCKS	CLOSE
2.	ENG IGNITION	OFF
3.	PANEL LTS (If at night)	EMERG
4.	MAIN AIR VLVs 1 and 2	CLOSE
5.	F/DK VLV	CLOSE

Descend to 30,000 feet at a speed up to V_{MO}/M_{MO}.

At or below 30,000 feet, attempt Windmill Relight or Starter-Assisted (Normal) Relight.

NOTE

Use standby instruments.

If engine relight attempts are unsuccessful, glide at V_{ERC} +5 KIAS. Make further relight attempts at 10,000-foot intervals.

OIL LOW PRESSURE

OIL #
LO PRESS

1.	OIL PRESSURE	CHECK GAGE READING

If below 25 psi:

2.	HP COCKS	CLOSE

Carry out Engine Failure procedure.

ENGINE FAILURE

Mechanical failure, malfunction, separation, or inability to maintain ITT or RPM within limits.

1. Affected Engine ..... IDENTIFY
2. HP COCK ..... CLOSE
3. LP COCK ..... CLOSE
4. GEN ..... TRIP
5. BUS TIE (If open) ..... CLOSE

If failure occurs during initial climb:

6. MAIN AIR VLVs 1 and 2 ..... CLOSE
7. F/DK VLV ..... CLOSE

8. MAIN AIR VLV ..... CLOSE (SEE NOTE 2)
9. F/DK VLV (No. 2 engine only) ..... CLOSE
10. ENG SYNC ..... OFF
11. ALTERNATOR ..... OFF
12. WING FUEL X FEED/TRANSFER lever ..... X FEED (USE PUMPS SELECTIVELY TO BALANCE FUEL)

If GEN AMPS Above Limit

1. Nonessential electrical loads ..... PROGRESSIVELY REDUCE UNTIL GEN AMPS LESS THAN LIMIT

NOTE

1. Always select the GEN to TRIP.
2. If descending in icing conditions, select MAIN AIR VLV of the operating engine to LP ON.
3. Do not attempt to restart engine if there are any reasons to suspect mechanical malfunction or failure.

AIR CONDITIONING/PRESSURIZATION

RAPID DEPRESSURIZATION

HORN SOUNDS AND **CABIN ALT**

1. Crew Oxygen ..... DON MASKS
2. MAIN AIR VLVs 1 and 2 ..... CLOSE
3. F/DK VLV ..... OPEN FULLY
4. Cabin Notices ..... ON
5. Cabin Altitude ..... CHECK
   a. If above 15,000 feet ..... CARRY OUT EMERGENCY DESCENT
   b. If above 12,500 feet ..... CHECK PASSENGER OXYGEN MASKS HAVE DROPPED

      If masks have not dropped ..... PULL PASSENGER SUPPLY EMERGENCY CONTROL KNOB
6. DUMP VALVE ..... CHECK SHUT
7. MANUAL CABIN ALTITUDE CONTROL ..... CHECK FULL DECREASE

NOTE

With the flight deck valve open and No. 2 engine at high power, a cabin altitude of approximately 9,000 feet can be maintained at 40,000 feet, assuming no abnormal leaks.

The flight deck will become very hot.

Subsequent Action

When below 10,000 ft:

1. F/DK VLV ..... CLOSE
2. DUMP VALVE ..... AS REQUIRED FOR VENTILATION

WARNING

The highest recommended cabin altitude for sustained flight is 25,000 feet.

REAR EQUIPMENT BAY OVERHEAT

REAR BAY OVHT

1. MAIN AIR VLVs 1 and 2 ..... CLOSE
2. F/DK VLV ..... OPEN FULLY

3. REAR BAY OVHT Warning ..... RECHECK

Proceed As Appropriate

If warning remains illuminated:

4. Crew Oxygen ..... DON MASKS

5. F/DK VLV ..... CLOSE

   a. If above 15,000 feet ..... CARRY OUT EMERGENCY DESCENT

   b. If cabin altitude above 12,500 feet ..... CHECK PASSENGER OXYGEN MASKS HAVE DROPPED

      If masks have not dropped ..... PULL PASSENGER SUPPLY EMERGENCY CONTROL KNOB

6. DUMP VALVE ..... AS REQUIRED FOR VENTILATION

Land as soon as possible.

If warning extinguishes:

Descend as necessary to maintain comfortable cabin and cockpit conditions.

HIGH-PRESSURE AIR OVERHEAT

HP AIR # OVHT

1. MAIN AIR VLV ..... CLOSE
2. F/DK VLV ..... CLOSE

When Warning Extinguishes

3. MAIN AIR VLV ..... LP ON
4. F/DK VLV ..... AS REQUIRED

EMERGENCY DESCENT

1. Thrust Levers ..... CLOSE
2. Speed ..... M_{MO}/V_{MO} (UNLESS STRUCTURAL DAMAGE IS SUSPECTED
3. AIR BRAKE ..... OPEN

Continue maximum rate descent until cabin altitude stabilizes below 15,000 feet, observing the minimum enroute altitude limitation.

ELECTRICAL SYSTEM

DOUBLE GENERATOR FAILURE

BATT 1 CNTCTR
BATT 2 CNTCTR
GEN 1 FAIL
BUS TIE OPEN
GEN 2 FAIL

ELECT ↑

and loss of copilot's EFIS displays

and 5 AC POWER annunciators: XS 1 FAIL, XS 2 FAIL, INV 1 FAIL, STBY INV ON, INV 2 FAIL and standby horizon warning buzzer.

Avoid flight in icing conditions (see NOTE 1 below).

1. PANEL LTS (If required) ..... EMERG
2. BATT ..... EMERG
3. GEN 1 and 2 ..... TRIP BOTH
4. One Generator ..... ATTEMPT TO RESET (SEE NOTE 2 BELOW)

If Unsuccessful

5. ENG CMPTRs 1 and 2 ..... OFF
6. ENG ANTICE 1 and 2 ..... ON
7. STBY INV ..... CHECK ARM
8. XE FAIL ..... IF ILLUMINATED (PROCEED AS FOR XE FAIL)
9. Electrical Loads ..... REDUCE TO MINIMUM (SEE NOTES 3 AND 4 BELOW)

If More Than 30 Minutes From Landing

6. RADIO 1 Master ..... OFF
7. MFD Master ..... OFF
8. Emergency Radio ..... ON (SEE NOTE 6 BELOW)
9. Audio Panels ..... PUSH EMER

NOTE

1. Airframe ice protection is not available. Ice accretion may give significant deterioration of performance.
2. To attempt a reset, hold one GEN switch to CLOSE for five seconds and then release. If unsuccessful, hold the other GEN switch to CLOSE for five seconds and then release. ***Do not*** make more than one attempt with each generator. If either generator is reset do not attempt to reset the other one; proceed as for Single Generator Failure (see Abnormal Procedures section) and reset electrical services as required.

3. It is essential that electrical loads are kept to a minimum for flight. If this procedure is followed there is sufficient battery power to maintain emergency loads for approximately 30 minutes. This assumes the continuous use of left pitot heater, the audio system, communications, captain's EFIS, MFD, ADS 1, ADF 1 or VHF NAV 1, AHRS 1 and intermittent us of:

   Chart Lights ..... TEN MINUTES TOTAL USE

   Cabin Temperature Control ..... IN MANUAL MODE

4. Other PE services must be switched off or isolated by pulling the relevant circuit breakers. The following loads may be selected on, at the pilot's discretion (Table EP-1).

Table EP-1. PE SERVICES AND SELECTED LOADS

SERVICE	DUTY CYCLE IN MINUTES	REDUCTION IN FLIGHT TIME IN MINUTES
Single Fuel Pump	5	2
	10	4
LANDING LAMP	5	2
	10	4
ENG IGNITION ON Single Engine	10	0.5
ENG IGNITION ON Two Engines	10	1
One Engine Computer	5	0.75
	10	1.5
Two Engine Computer	5	1.5
	10	3

5. The emergency flight time quoted is based upon the assumption that, at the time double generator failure occurs, the aircraft batteries are at a minimum allowable capacity of 80% and with an electrolyte temperature of –20°C. These are the anticipated most severe conditions. More favorable conditions will extend the emergency flight time as will circumstances which permit limiting the use of all the services available.

6. Emergency flight time can be increased by switching RADIO MASTER 1 off, MFD master off, emergency radio on, and using the standby instruments. AHRS 1 will continue running off PE power. When close to landing, or when emergency battery fails, RADIO MASTER 1 can be switched on and emergency radio off. The captain's EFIS and No. 1 radios and NAVs will then operate until main battery power is depleted. The MFD master should remain off.

BATTERY OVERHEAT (NICAD ONLY)

In Flight

1. BATT ..... EMERG

BATT # OVHT AND BATT # HOT AND ELECT ↑

2. BATT HEATER Circuit Breaker (If Installed) ..... PULL

Land as soon as practicable.

On The Ground

1. BATT ..... OFF

Shut down engines and APU and investigate.

XE FAIL

1. STBY INV ON Annunciator ..... CHECK

XE FAIL AND ELECT ↑

Proceed as appropriate (Figure EP-1):

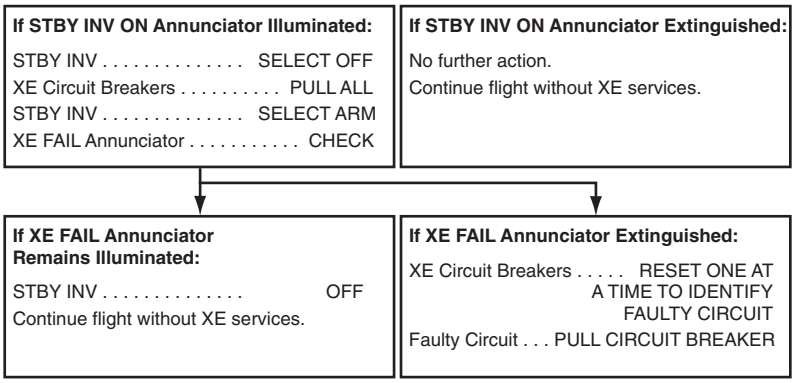

If STBY INV ON Annunciator Illuminated:
STBY INV . . . . . SELECT OFF
XE Circuit Breakers . . . . . PULL ALL
STBY INV . . . . . SELECT ARM
XE FAIL Annunciator . . . . . CHECK
If STBY INV ON Annunciator Extinguished:
No further action.
Continue flight without XE services.
If XE FAIL Annunciator Remains Illuminated:
STBY INV . . . . . OFF
Continue flight without XE services.
If XE FAIL Annunciator Extinguished:
XE Circuit Breakers . . . . . RESET ONE AT A TIME TO IDENTIFY FAULTY CIRCUIT
Faulty Circuit . . . PULL CIRCUIT BREAKER

Figure EP-1. STBY INV ON Annunciator Procedures

XS 1 FAIL AND XE FAIL



1. XE BUS PROT Circuit Breaker ..... PULL

2. STBY INV Circuit Breaker ..... CHECK SET

   If Tripped and Cannot Be Reset ..... PULL ALL XE CIRCUIT BREAKERS, THEN RESET STBY INV CIRCUIT BREAKER

3. STBY INV Switch ..... SELECT OFF THEN ARM

4. XE FAIL Annunciator ..... CHECK

Proceed as appropriate (Figure EP-2):

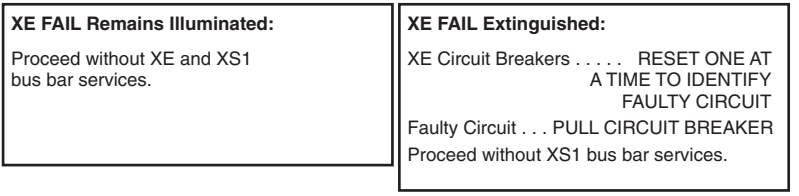

XE FAIL Remains Illuminated:
Proceed without XE and XS1 bus bar services.
XE FAIL Extinguished:
XE Circuit Breakers . . . . . RESET ONE AT A TIME TO IDENTIFY FAULTY CIRCUIT
Faulty Circuit . . . PULL CIRCUIT BREAKER
Proceed without XS1 bus bar services.

Figure EP-2. XS 1 FAIL and XE FAIL Annunciator Procedures

FIRE/SMOKE PROCEDURES

ENGINE FIRE IN FLIGHT

ENG # FIRE AND FIRE BELL SOUNDS AND ENG # FIRE

1. Affected Engine ..... IDENTIFY
2. HP COCK ..... CLOSE
3. LP COCK ..... CLOSE
4. GEN ..... TRIP
5. BUS TIE (If Open) ..... CLOSE
6. ENG EXT ..... SHOT 1

If fire warning occurs during initial climb:

7. MAIN AIR VLVs 1 and 2 ..... CLOSE
8. F/DK VLV ..... CLOSE
9. MAIN AIR VLV ..... CLOSE
10. F/DK VLV (No. 2 Engine Only) ..... CLOSE
11. ENG SYNC ..... OFF
12. ALTERNATOR ..... OFF
13. WING FUEL X FEED/TRANSFER Lever ..... X FEED (USE PUMPS SELECTIVELY TO BALANCE FUEL

If Fire Warning Remains Illuminated

14. ENG EXT ..... SHOT 2

If GEN AMPS Above Limit

15. Nonessential Electrical Loads ..... PROGRESSIVELY REDUCE UNTIL LESS THAN LIMIT

NOTE

1. Always select the GEN to TRIP.
2. If descending in icing conditions, select MAIN AIR VLV of operating engine to LP ON.

3. Do not attempt to restart engine.

ENGINE FIRE ON GROUND

ENG # FIRE AND FIRE BELL SOUNDS AND ENG # FIRE

1.	Affected Engine	IDENTIFY
2.	START PWR Switch (Starting Only)	PUSH FOR ABORT
3.	HP COCK	CLOSE
4.	LP COCK	CLOSE
5.	GEN	TRIP
6.	BUS TIE (If Open)	CLOSE
7.	ENG EXT	SHOT 1

After 30 seconds, if ENG FIRE remains illuminated:

8.	ENG EXT	SHOT 2

NOTE

Second shot facility is only available via generated power or external power.

9.	Other HP COCK	CLOSE
10.	Other LP COCK	CLOSE
11.	FUEL PUMPS	OFF BOTH

NOTE

1. Do not attempt to restart the engine after a fire warning.
2. Closure of the No. 1 engine LP COCK will automatically shut down the APU if it is running.

APU FIRE

APU FIRE AND FIRE BELL SOUNDS

1.	MASTER Switch	OFF
2.	FIRE EXT Switch	OPERATE

FUSELAGE FIRE OR SMOKE

Fire or smoke from cabin furnishing or equipment other than from electrical/electronic sources.

1.	Crew Oxygen	DON MASKS–100%, EMERG
2.	Smoke Goggles	DON AND VENT
3.	Cabin Notices	ON

4. DUMP VALVE ..... OPEN SLOWLY TO ASSIST SMOKE CLEARANCE, BUT MAINTAIN CABIN PRESSURE

Once crewmember don portable breathing equipment (PBE) and use handheld fire extinguisher to take appropriate action.

Visually verify that any fire has been extinguished. If verification is not established, land as soon as possible.

ELECTRICAL FIRE OR SMOKE

1.	Crew Oxygen	DON MASKS–100%, EMERG
2.	Smoke Goggles	DON AND VENT
3.	Cabin Notices	ON

4. DUMP VALVE ..... OPEN SLOWLY TO ASSIST SMOKE CLEARANCE, BUT MAINTAIN CABIN PRESSURE

5. PANEL LTS (If Required) ..... EMERG

6. AUTOPILOT and YAW DAMPER ..... DISENGAGE

7. BATT ..... EMERG

8. GEN 1 and 2 ..... TRIP BOTH

9. ALTERNATORS 1 and 2 ..... OFF

10. ENG CMPTR 1 and 2 ..... OFF

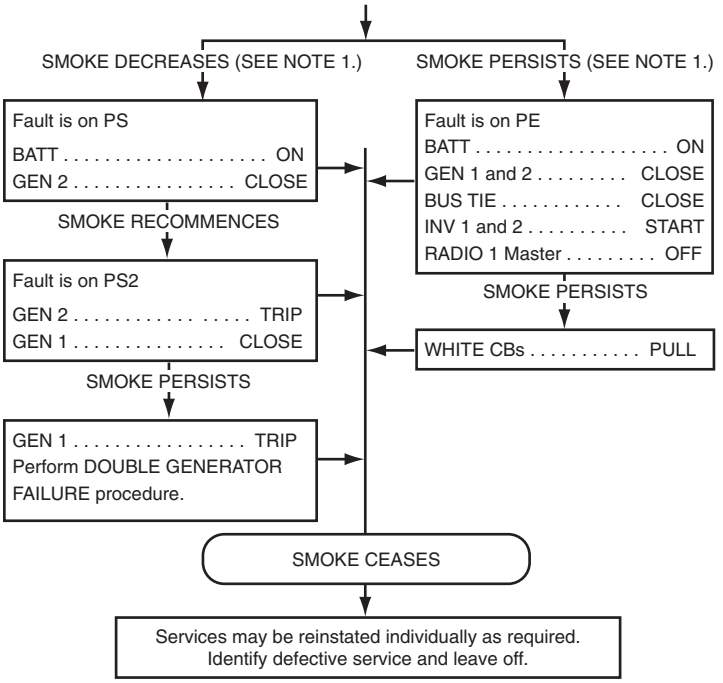

SMOKE DECREASES (SEE NOTE 1.)
SMOKE PERSISTS (SEE NOTE 1.)
Fault is on PS
BATT . . . . . ON
GEN 2 . . . . . CLOSE
SMOKE RECOMMENCES
Fault is on PS2
GEN 2 . . . . . TRIP
GEN 1 . . . . . CLOSE
SMOKE PERSISTS
GEN 1 . . . . . TRIP
Perform DOUBLE GENERATOR FAILURE procedure.
Fault is on PE
BATT . . . . . ON
GEN 1 and 2 . . . . . CLOSE
BUS TIE . . . . . CLOSE
INV 1 and 2 . . . . . START
RADIO 1 Master . . . . . OFF
SMOKE PERSISTS
WHITE CBs . . . . . PULL
SMOKE CEASES
Services may be reinstated individually as required.
Identify defective service and leave off.

Figure EP-3. Electrical Fire or Smoke Procedures

Visually verify that any fire has been extinguished. If verification is not established, land as soon as possible.

WARNING

Flight time is limited with both generators tripped.

NOTE

1. It may take up to two minutes to ascertain smoke decreasing or persisting.

2. When depressurized, open DUMP VALVE fully to improve smoke clearance.

SMOKE FROM AIR-CONDITIONING DUCTS

1. Crew Oxygen ..... DON MASKS–100%, EMERG
2. Smoke Goggles ..... DON AND VENT
3. Cabin Notices ..... ON
4. DUMP VALVE..... OPEN SLOWLY TO ASSIST SMOKE CLEARANCE, BUT MAINTAIN CABIN PRESSURE
5. MAIN AIR VLVs 1 and 2 ..... LP ON
6. F/DK VLV ..... CLOSE

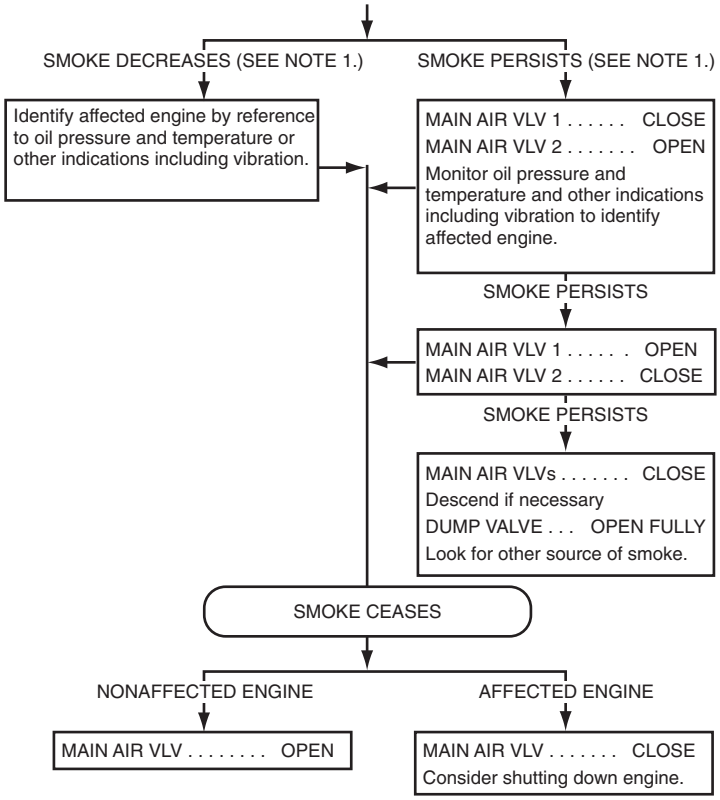

SMOKE DECREASES (SEE NOTE 1.)
SMOKE PERSISTS (SEE NOTE 1.)
Identify affected engine by reference to oil pressure and temperature or other indications including vibration.
MAIN AIR VLV 1 . . . . . CLOSE
MAIN AIR VLV 2 . . . . . OPEN
Monitor oil pressure and temperature and other indications including vibration to identify affected engine.
SMOKE PERSISTS
MAIN AIR VLV 1 . . . . . OPEN
MAIN AIR VLV 2 . . . . . CLOSE
SMOKE PERSISTS
MAIN AIR VLVs . . . . . CLOSE
Descend if necessary
DUMP VALVE . . . OPEN FULLY
Look for other source of smoke.
SMOKE CEASES
NONAFFECTED ENGINE
AFFECTED ENGINE
MAIN AIR VLV . . . . . OPEN
MAIN AIR VLV . . . . . CLOSE
Consider shutting down engine.

Figure EP-4. Smoke from Air-Conditioning Ducts Procedures

Visually verify that any fire has been extinguished. If verification is not established, land as soon as possible.

NOTE

1. It may take up to two minutes to ascertain smoke decreasing or persisting.

2. When depressurized, open DUMP VALVE fully to improve smoke clearance.

LANDING GEAR

LANDING GEAR—THREE GREENS NOT INDICATED

1. HORN ..... PULL CIRCUIT BREAKER

2. GPWS (If Installed) ..... PULL CIRCUIT BREAKER

3. If All Gears Locked Down shown by Standby Indicators ..... MAKE A NORMAL LANDING

   If All Gears Not Locked Down shown by Standby Indicators:

   a. AUX HYD SYSTEM ..... PULL HANDLE, DO NOT RESET

   b. HAND PUMP ..... OPERATE

CAUTION

When operating the auxiliary hydraulic system to lower the landing gear, the hand pump action must be continued, after three greens are achieved, until positive resistance is felt to make sure the landing gear is down and locked.

Proceed according to how many gear legs are locked down (see NOTE 1.) (Figure EP-5).

NOTE

1. The position of the landing gear shall be established by checking the normal (green) and standby indicators.

2. The flight crew has the choice to land with the gear down or to retract the gear and perform an all gear up landing. Although an all gear up landing should result in less damage to the airplane than landing with two gear legs locked down, passengers will experience an unpleasant landing impact and a longer period of time may be required to clear the airplane from the runway.

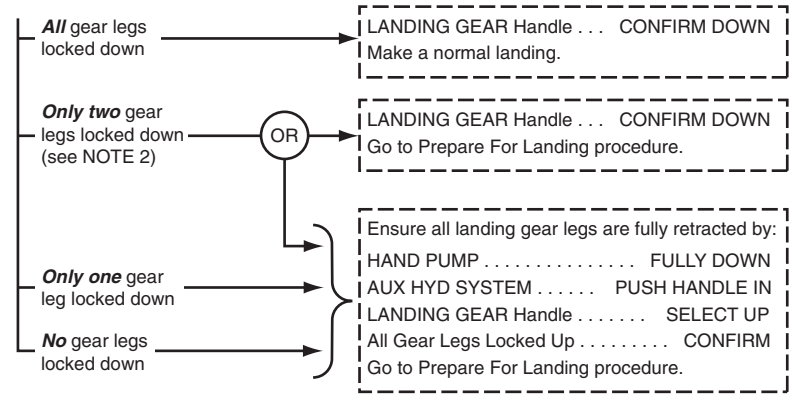

All gear legs locked down
LANDING GEAR Handle . . . CONFIRM DOWN
Make a normal landing.
Only two gear legs locked down (see NOTE 2)
OR
LANDING GEAR Handle . . . CONFIRM DOWN
Go to Prepare For Landing procedure.
Only one gear leg locked down
No gear legs locked down
Ensure all landing gear legs are fully retracted by:
HAND PUMP . . . . . FULLY DOWN
AUX HYD SYSTEM . . . . . PUSH HANDLE IN
LANDING GEAR Handle . . . . . SELECT UP
All Gear Legs Locked Up . . . . . CONFIRM
Go to Prepare For Landing procedure.

Figure EP-5. Landing Gear with Three Greens Not Indicated Procedures

Prepare For Landing

1. Passengers ..... BRIEF FOR EMERGENCY LANDING
2. Loose Equipment ..... SECURE
3. Emergency Exit ..... CONFIRM CLEAR
4. MAIN AIR VLVs 1 and 2 ..... CLOSE
5. DUMP VALVE ..... OPEN

Landing

- Land at as low weight as possible.
- Use normal landing flap setting.
- Touch down at as low a speed as practicable.
- Do not use lift dump.
- Do not deploy thrust reversers.

After Touchdown

1. With two gear legs locked down:

   a. Keep the unsupported wing or nose off the ground until at a low speed, but lower wing or nose before control is lost.

b. After lowering the unsupported wing or nose, use wheel brakes and nosewheel steering, if appropriate, to keep in a straight line.

c. If the nose gear is not locked down, select HP COCKS closed at touchdown.

2. With all gear up:

a. Select HP COCKS closed at touchdown.

NOSEWHEEL NOT CENTERED WITH LANDING GEAR LOCKED DOWN

If steering handwheel is offset to such a position that the nosewheels are likely to steer the airplane off the runway:

- Turn handwheel to the center position

1. If Handwheel Remains Centered with Hands Off ..... MAKE A NORMAL LANDING

   If Handwheel Does Not Remain Centered with Hands Off ..... PERFORM AN ALL GEAR UP LANDING AS FOLLOWS:

   a. Horn ..... PULL CIRCUIT BREAKER

   b. GPWS (If Installed) ..... PULL CIRCUIT BREAKER

   c. LANDING GEAR Handle ..... SELECT UP

   d. All Gear Locked Up ..... CONFIRM

Prepare For Landing

2. Passengers ..... BRIEF FOR EMERGENCY LANDING

3. Loose Equipment ..... SECURE

4. Emergency Exit ..... CONFIRM CLEAR

5. MAIN AIR VLVs 1 and 2 ..... CLOSE

6. DUMP VALVE ..... OPEN

Landing

- Land at as low a weight as possible.

- Use normal landing flap setting.
- Touch down at as low a speed as practicable.
- Do not use lift dump.
- Do not deploy thrust reversers.

After Touchdown

- Select HP COCKS closed at touchdown.

WHEEL BRAKES

BRAKE FAILURE

Total or partial (asymmetric) failure of normal braking.

1.	Brake Pedals	RELEASE
2.	WHEEL BRAKE Lever	EMERG
3.	Brake Pedals	APPLY GENTLY, USE ONE CONTINUOUS APPLICATION IF POSSIBLE

NOTE

Antiskid will be inoperative.

NOTE

If nosewheel steering has failed, directional control can be maintained by differential braking and, at high speed, by rudder and aileron control. If partial (asymmetric) braking is caused by brake hose failure, nosewheel steering may be available for up to 40 seconds. Do not attempt to taxi.

EMERGENCY EVACUATION

The captain will stop the airplane and initiate the emergency evacuation.

The following captain and first officer memory items should be performed simultaneously. In the event of pilot incapacitation, the captain's memory items should, as far as practicable, be performed first followed by the first officer's memory items.

CAPTAIN:

1. Airplane ..... STOP
2. WHEEL BRAKE Lever ..... PARK
3. HP COCKS ..... CLOSE
4. LP COCKS ..... CLOSE
5. PA ..... ORDER EVACUATION

FIRST OFFICER:

1. DUMP VALVE ..... OPEN
2. ENG 1 and 2 EXT ..... SHOT 1 ON BOTH
3. APU FIRE EXT (If Installed) ..... OPERATE
4. Call ATC on VHF COMM No. 1

NOTE

1. Apply the parking brake as soon as possible to make sure the airplane does not move during evacuation. However, circumstances may make it necessary to order evacuation as soon as the airplane has come to rest.

2. If practicable, take account of the effect of wind conditions on the spread of fire.

3. VHF COMM No. 1 must be used to call ATC as only battery power will be available.

4. BATT must be left on to make sure the PA and VHF COMM No. 1 remain available for passenger and ATC communication.

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LIMITATIONS

KINDS OF OPERATION

This aircraft is eligible for certification in the Transport Category and is approved for the following kinds of operation when the appropriate instruments and equipment required by the airworthiness and/or operating certificate are installed, approved, and in operable condition.

- Atmospheric icing conditions
- Day and night VFR
- IFR

However, the certificate of airworthiness may restrict this aircraft to some other category and to a particular use.

WEIGHT LIMITATIONS

MAXIMUM TAXIING WEIGHT

The maximum permissible taxiing (ramp) weight is 28,120 lb.

MAXIMUM TAKEOFF WEIGHT

The maximum permissible weight at the start of the takeoff run is 28,000 lb.

MAXIMUM LANDING WEIGHT

The maximum permissible landing weight, except in an emergency, is 23,350 lb.

ZERO FUEL WEIGHT

The zero fuel weight is defined as the loaded weight of the aircraft less the weight of the usable fuel carried and shall be within the following limits:

- Minimum ..... 14,120 lb
- Maximum ..... 18,450 lb

PERFORMANCE LIMITATIONS

TAKEOFF WEIGHT

The takeoff weight shall not exceed that specified by Figures 5.15.1 through 5.15.5 of the *Approved flight Manual (AFM)* as appropriate to whichever flap setting is assumed when complying with the takeoff field lengths limitations stated below; the use of the engine bleeds; and the altitude of the airport and for the air temperature existing at the time of takeoff.

LANDING WEIGHT

The takeoff weight shall be such that, allowing for normal consumption of fuel and oil in flight to the airport of destination or to the alternate airport, the weight on arrival will not exceed that specified by Figure 5.45.1 of the *AFM* appropriate to the use of engine bleeds and the altitude and anticipated air temperature of each of the airports involved.

TAKEOFF FIELD LENGTHS

The takeoff weight shall not exceed the maximum permitted by field length considerations as calculated by the method described in subsection 5.20 and the use of Figures 5.20.2 through 5.20.9 of the *AFM* as appropriate to whichever flap setting is intended to be used for the takeoff; the use of anti-icing; the altitude of the airport; the runway to be used; the effective runway slope; the wind component along the runway; and the air temperature existing at the time of takeoff, or as set out in Supplement 4 for the restricted range of conditions listed.

When complying with the above, the following conditions shall be met:

- The accelerate-stop distance available used in the graphs shall not be greater than the length of runway plus the length of stopway if present.
- The takeoff distance used in the graphs shall not be greater than the length of runway plus the length of clearway if present; except the length of clearway shall not be greater than one-half of the length of the runway.
- The takeoff run used in the graphs shall not be greater than the length of the runway.

OPERATIONAL LIMITATIONS

ALTITUDE

The maximum and minimum airport altitudes for takeoff or for landing are 9,000 and –2,000 feet, respectively. Performance appropriate to sea level shall be used when the airport altitude is below sea level.

AIR TEMPERATURE

The maximum air temperature for all flight regimes is ISA +35°C. The minimum air temperature for takeoff and landing is –40°C and for enroute flight is –75°C. When the temperature is below the lowest scheduled, performance appropriate to the lowest scheduled temperature shall be used.

WIND COMPONENT

The maximum tailwind component for takeoff and landing appropriate to a height of 33 feet is 10 knots.

RUNWAY SLOPE

The maximum effective runway slopes for takeoff are 2% uphill and 2% downhill.

AIRPLANE CONFIGURATIONS

The airplane configurations as stated in subsection 5.05 of the *AFM* must be observed.

COMPARTMENT LOADING LIMITATIONS

The aircraft must be loaded in accordance with the *Aircraft Weight and Balance Manual* and as placarded in the baggage/stowage compartments.

FUEL LOADING

Fuel tanks may be replenished in any sequence providing appropriate refueling instructions are observed and the following preflight fuel loading conditions are achieved:

- Fuel contained in the wing tanks shall be equally disposed between the two wing tanks.
- Fuel must not be carried in the ventral tank unless each main wing tank contains at least 3,450 lb of fuel.
- Before flights on which it is to be utilized, the ventral tank must be filled completely. For other flights it must be empty.

PRESSURE REFUELING

Takeoff must not be initiated if the amber FUEL annunciator on the MWS panel and the amber REFUEL ON annunciator on the roof panel are illuminated.

FUEL SYSTEM MANAGEMENT

During flight, including takeoff and landing, the difference in fuel quantity between the two wing tanks must not exceed 500 lb.

Fuel carried in the ventral tank shall be transferred into the wing tanks when the fuel level in the wing tanks has fallen to 3,300 lb per side.

The aircraft must not be landed with fuel in the ventral tank except in an emergency.

LOAD LIMITATIONS—CENTER OF GRAVITY

The center of gravity must always lie between the forward and aft limits as defined in the envelope shown in Figure LIM-1.

The limits apply with the landing gear up. The effect of the landing gear in the down position is negligible.

The center-of-gravity datum is 11.00 feet forward of the reference point on the fuselage. The reference point is defined by an eye bolt on the fuselage skin located beneath the starboard engine pod.

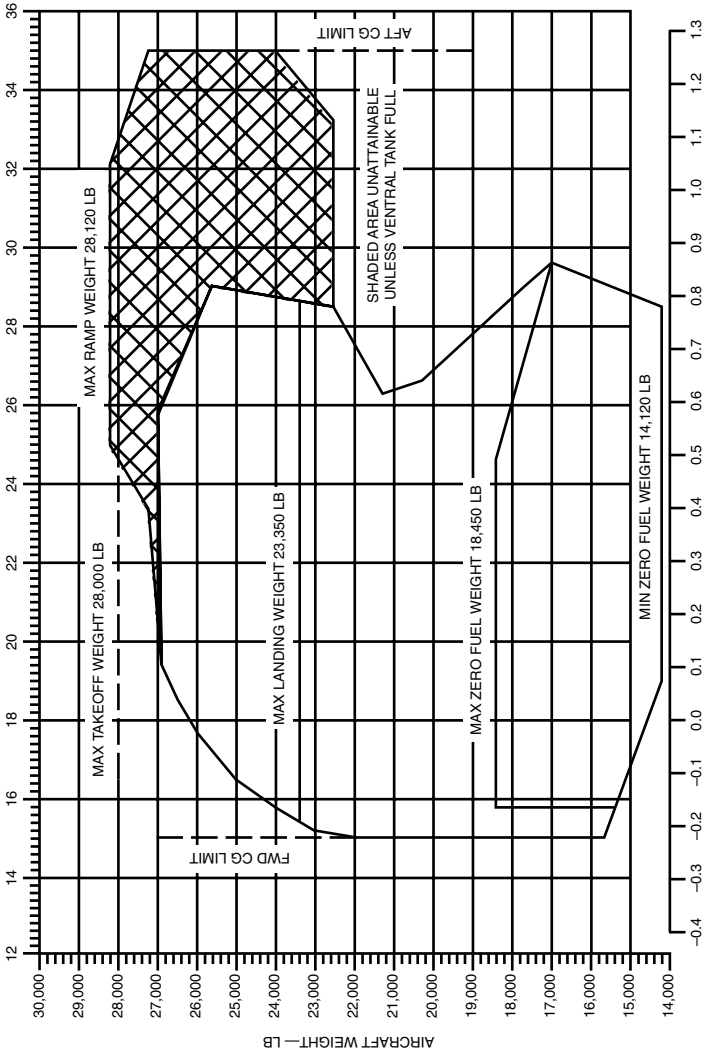

AFT CG LIMIT
SHADED AREA UNATTAINABLE
UNLESS VENTRAL TANK FULL
MAX RAMP WEIGHT 28,120 LB
MAX TAKEOFF WEIGHT 28,000 LB
MAX LANDING WEIGHT 23,350 LB
MAX ZERO FUEL WEIGHT 18,450 LB
MIN ZERO FUEL WEIGHT 14,120 LB
FWD CG LIMIT
AIRCRAFT WEIGHT — LB
DISTANCE FROM CG DATUM — FEET (+VE AFT)

Figure LIM-1. Center of Gravity

ICE PROTECTION LIMITATIONS

GENERAL—ICING CONDITIONS DEFINITION

Icing conditions exist when outside air temperature (OAT) on the ground and during takeoff—or total air temperature (TAT) in flight—is 10°C or below and visible moisture in any form is present (e.g., clouds, fog with visibility of 1 mile or less, rain, snow, sleet and ice crystals).

Icing conditions also exist when the OAT on the ground and for takeoff is 10°C or below when operating on ramps, taxiways, or runways where surface snow, ice, standing water or slush may be ingested by the engines or freeze on the engines, nacelles or engine sensor probes.

AIRFRAME ICING—CLEARANCE OF SNOW, ICE AND FROST

The aircraft must be clear of snow, ice and frost before takeoff with the exception of the following areas:

- Frost is allowable on the underside of the wings over the general area of the fuel tanks providing the depth does not exceed 0.125 inch. If frost is present in this region, the WAT limited takeoff weight must be reduced by 1,000 lb. The net flight path reference and fourth segment climb gradients must be obtained using a weight 1,000 lb higher than the actual weight.

- Frost is allowable on the fuselage providing the layer is thin enough to distinguish the surface features such as paint lines or markings underneath; but, all vents, probes and ports must be clear of frost.

WING/TAIL ANTI-ICE SYSTEM

Only deice fluids TKS 80, R328 or fluid to specification DTD 406B must be used.

NOTE

A tank indicating FULL provides priming and protection for a period of at least 85 minutes.

ENGINE ICING

Refer to powerplant limitations.

POWERPLANT LIMITATIONS

ENGINE TYPE

The Hawker 800 XP has two AlliedSignal Engines TFE731-5BR-1H turbofan power units.

FUEL LIMITS

The fuels and additives in Table LIM-1 are approved for use with this engine installation.

Table LIM-1. APPROVED FUELS/ADDITIVES

AVIATION KEROSENE TO THE CURRENT APPROVED ISSUE OF THE FOLLOWING SPECIFICATIONS:

BRITISH	DEF STAN 91-87 (D.E.R.D. 2453) DEF STAN 91-91 (D.E.R.D. 2494)
AMERICAN	ASTM D1655/JET A ASTM D1655/JET A-1 MIL-T-83133/JP8
CANADIAN	CAN/CGSB 3.23/JET A CAN/CGSB 3.23/JET A-1
RUSSIAN	GOST 10227-86 TS-1 GOST 10227-86 T-1 GOST 10227-86 RT

AVIATION WIDE-CUT FUEL TO THE CURRENT APPROVED ISSUE OF THE FOLLOWING SPECIFICATIONS:

BRITISH	DEF STAN 91-88 (D.E.R.D. 2454)
AMERICAN	ASTM D1655/JET B MIL-T-5624/JP5 MIL-T-5624/JP4
CANADIAN	CAN/CGSB 3.22/JET B
RUSSIAN	GOST 10227-86 T-2

Fuel Additives

Anti-Static

STADIS 450 additive may be used in concentrations not exceeding 3 parts per million (ppm) by volume.

SIGBOL additive TU38-101741-78 may be used in concentrations not exceeding 0.0005% by volume.

Anti-Icing and Biocidal Additives

For anti-icing and preventative continuous Biocidal treatment, DEF STAN 68-252 (D.E.R.D. 2451 Issue 1 and Issue 2), MIL-I-27686 or MIL-I-85470 may be used in concentrations not exceeding 0.15% by volume.

NOTE

The above additives should not be added to fuel to specification DEF STAN 91-87 (D.E.R.D. 2453), MIL-T-5624 and MIL-T-83133 as they are already present in these fuels.

TGF to GOST 17477-86, TGF(M) to TU 6-10-1457-79, I to GOST 8313-88, I(M) to TU 6-10-1458-79 may be used in concentrations not exceeding 0.3% by volume.

Biobor JF may be used at concentrations not exceeding 135 ppm by weight, as preventative biocidal treatment. For biocidal shock treatment, Biobor JF may be used at concentrations not exceeding 270 ppm by weight, provided it is subsequently off-loaded prior to engine start. (The 135 ppm concentration is the maximum for engine operation.)

Anti-Corrosive Additive

Fuels may contain additives complying with DEF STAN 68-251 (D.E.R.D. 2461) or MIL-I-25017 at concentrations permitted by the fuel specification.

NOTE

Fuel to specification DEF STAN 91-87 (D.E.R.D. 2453) already includes HITEC E515.

Minimum Fuel Temperature

To avoid the possibility of fuel freezing or exceeding engine limitations, the ambient air and indicated fuel temperature limitations shown in Table LIM-2 should be observed.

Maximum Fuel Temperature

The maximum permissible fuel temperature is 57°C. This limit is placarded.

Table LIM-2. AMBIENT AIR AND FUEL TEMPERATURE LIMITS

FUEL	MINIMUM FUEL OR AMBIENT AIR TEMP AT TAKEOFF	MINIMUM FUEL TEMP IN FLIGHT	FUEL FREEZING TEMP
DEF STAN 91-91 (D.E.R.D. 2494) DEF STAN 91-87 (D.E.R.D. 2453) ASTM D1655/JET A-1 MIL-T-83133/JP8 CAN/CGSB 3.23/JET A-1	–42°C	–45°C	–47°C
ASTM D1655/JET A CAN/CGSB 3.23/JET A	–35°C	–38°C	–40°C
DEF STAN 91-88 (D.E.R.D. 2454) MIL-T-5624/JP4 MIL-T-5624/JP5	–53°C –35°C	–54°C –38°C	–58°C –40°C
ASTM D1655/JET B CAN/CGSB 3.22/JET B	–45°C	–48°C	–50°C
GOST 10227-86 TS-1 GOST 10227-86 T-1 GOST 10227-86 T-2	–54°C	–54°C	–60°C
GOST 10227-86 RT	–50°C	–53°C	–55°C

Table LIM-3. FUEL QUANTITY

LOCATION	IMPERIAL GALLONS	EQUIVALENT U.S. GALLONS	EQUIVALENT LITERS
WING TANK (EITHER SIDE)	528	634	2,400
VENTRAL TANK	194	233	882

Fuel Quantity

The usable fuel capacity of each tank when gravity filled is shown in Table LIM-3.

Credit shall not be taken for any fuel remaining in the tanks when the fuel quantity indicators read zero in level flight.

After pressure refueling the contents of each wing tank will be 2.4 U.S. gallons less and the contents of the ventral tank will be 3.6 U.S. gallons less.

The contents of the ventral tank are reduced by 4.8 U.S. gallons for aircraft which have an external toilet servicing facility.

OIL LIMITS

Approved Oils

The oils approved for the engines are Exxon 2380, Mobil Jet Oil II, Mobil Jet 254, Castrol 5000, Aeroshell 500, and Aeroshell 560.

Oil Temperature

The maximum oil temperature is 127°C at sea level and up to 30,000 feet. Above 30,000 feet it is 140°C.

Transient oil temperatures up to 149°C at any altitude are permissible providing the duration above maximum does not exceed two minutes.

Minimum oil temperature for engine starting is –40°C.

Minimum oil temperature before takeoff is +30°C.

These limits are placarded.

Oil Pressure (Gage)

The placarded limits are:

- Takeoff, maximum continuous and climb thrusts ..... 38 to 46 psi
- Idle ..... 25 psi/minimum
- Maximum transient for up to three minutes ..... 55 psi

Oil Consumption

The maximum permissible oil consumption rate of an engine during any flight is 0.008 Imperial gallons (0.036 liters) per hour.

ENGINE FUEL COMPUTER

Flight must not be initiated with an engine fuel computer unserviceable.

ENGINE SYNCHRONIZER

The ENG SYNC switch must be selected OFF for takeoff.

AUTOMATIC PERFORMANCE RESERVE (APR)

The automatic performance reserve (APR) system must be armed for takeoff, except for crew training only when it does not need to be armed.

STARTING AND RELIGHTING

Starting and relighting limits are placarded. (See Table LIM-4.)

MAXIMUM TAKEOFF THRUST AND MAXIMUM CONTINUOUS CONDITIONS

Initial maximum takeoff thrust is selected by the pilot on takeoff. When the automatic performance reserve (APR) system is operative, maximum takeoff (APR) thrust will be obtained automatically on one engine if the other engine fails during the takeoff. The five-minute limit of maximum APR thrust must include the duration of operation at initial maximum takeoff thrust prior to the operation of the APR. Any normal takeoff limitations exceeded during APR operation must be recorded in the technical log. Thrust conditions are placarded. (See Table LIM-5.)

MAXIMUM OVERSPEED CONDITION

The maximum overspeed limits in Table LIM-6 are placarded.

ICE PROTECTION SYSTEM

The ENG ANTICE switches for the engine intake ice protection system may be selected ON at any engine speed including the use of maximum takeoff thrust for takeoff and balked landing.

ENGINE INSTRUMENT MARKINGS

- Red radial mark ..... Maximum or minimum limit
- Yellow arc ..... Cautionary range permissible for short duration or in special circumstances
- Green arc ..... Normal operating range

THRUST REVERSERS

Deployment of either thrust reverser is restricted to ground operations only.

The thrust reverse levers must not be selected until the aircraft is on the ground.

Engine starts with thrust reversers deployed are prohibited.

Reverse thrust must not be used to taxi rearwards.

Thrust in excess of reverse idle must not be selected below speeds of 50 knots IAS, except in an emergency.

When operating on unpaved surfaces, reverse idle must not be exceeded except in an emergency.

Table LIM-4. START AND RELIGHT LIMITS

	MAX ITT° C	TIME LIMIT
START OR RELIGHT	978 996 OVER 996	UNRESTRICTED 10 SECONDS 5 SECONDS

Table LIM-5. THRUST CONDITIONS

CONDITION	%RPM		MAX ITT° C	TIME LIMIT
	N_1	N_2		
MAXIMUM TAKEOFF (APR) THRUST	100	100.8	996 1006 1016	5 MINUTES 5 SECONDS 2 SECONDS
INITIAL MAXIMUM TAKEOFF THRUST (APR NOT OPERATING)	100	100	978 1006 1016	5 MINUTES 5 SECONDS 2 SECONDS
MAXIMUM CONTINUOUS	100	100	968	UNRESTRICTED (SEE NOTE)
NOTE: THIS IS NOT A NORMAL CRUISE SETTING.				

Table LIM-6. MAXIMUM OVERSPEED CONDITION

CONDITION	%RPM		TIME LIMIT
	N_1	N_2	
MAXIMUM OVERSPEED	103	103	5 SECONDS

AUXILIARY POWER UNIT (APU) LIMITATIONS

APU GENERAL LIMITATIONS

The Hawker 800 XP uses a Sundstrand Turbomach Model T-62T-40C8D1 or Garrett GTCP 36-150W auxiliary power unit.

AUTOMATIC APU SHUTDOWN

If the APU is shut down by the automatic protection functions, no attempt must be made to restart the APU until the cause of the shutdown has been established by reference to the BITE system in the rear equipment bay. Prior to flight, the APU and the rear equipment bay must be inspected for damage that may have resulted from an APU rotor failure.

STARTER MOTOR CYCLE LIMITATIONS

After shutdown or after an aborted start, one minute must be allowed to elapse after the APU has stopped before attempting another start. If after three successive attempts the APU will not start, have the cause investigated and corrected. Allow a minimum of thirty minutes to elapse before attempting another start.

EGT LIMITATIONS

The maximum permissible EGT is as follows:

	SOLAR	GARRETT
• Normal Operation	1080° F	732° C
• Starting	1380° F	870° C

OVERSPEED LIMITATION

The maximum permissible overspeed is 110% rpm.

APU GENERATOR LIMITATION

	SOLAR	GARRETT
The maximum continuous load current	250 amps	0.80 load

APPROVED FUELS

The fuels approved for the APU are those quoted in the powerplant limitations (Table LIM-1).

APPROVED OILS

The oils approved for use in the APU are those that meet specifications MIL-L-23699, MIL-L-7808, or the commercial equivalents.

AUTOPILOT AND FLIGHT GUIDANCE SYSTEM LIMITATIONS

The following limitations apply to the Collins APS-85 and EFIS-86E(4).

GENERAL

After applying power to the AHRS, the aircraft must not be moved until the attitude and heading warnings have cleared.

The autopilot and yaw damper must not be engaged for takeoff.

The autopilot must not be engaged during any flight when the autotrim is known to be unserviceable before takeoff.

If the autopilot is required in severe atmospheric turbulence, TURB mode must be selected.

Except in accordance with the conditions given below, the autopilot must be disengaged when the aircraft is lower than 1,000 feet above the terrain.

The yaw damper, if used, must be disconnected before touchdown.

Whenever the flight guidance system is coupled to a VOR or ILS, the associated FMS remote TUNE annunciator must not be illuminated.

The flight management system is not approved as an IFR approach aid.

OPERATION BELOW 1,000 FEET AGL

The autopilot may be engaged below 1,000 feet provided the following:

- The controlling pilot follows through on the flight controls.
- If the aircraft is making an approach to land with VS, VNAV, IAS or DESCEND mode engaged and the rate of descent is less than 1,000 fpm, the autopilot may remain engaged to 300 feet AGL.
- If the aircraft is climbing with VS, IAS, or CLIMB mode selected, the autopilot may be engaged at 300 feet AGL.

COUPLED APPROACH

The autopilot and flight guidance system are not approved for decision heights below 200 feet.

Provided that the decision (see note below) is not less than 200 feet above the runway threshold elevation (ARTE), the autopilot may remain engaged down to 80 feet ARTE provided the following:

- The autopilot is coupled to an ILS localizer and glideslope in the APPR mode.
- If the autopilot disengages or is disengaged below 1,000 feet, it must remain disengaged for that approach but the yaw damper may be engaged.

If a single engine approach is made, the autopilot must be disengaged at 200 feet before selecting flaps 45°.

NOTE

The decision height is the wheel height ARTE by which a go-around must be initiated unless adequate visual reference has been established. The airplane's position and approach path have been visually assessed as satisfactory to continue the approach and landing.

AIRSPEED LIMITATIONS

MAXIMUM OPERATING SPEED (V_{MO}/M_{MO})

The maximum operating limit speed and Mach number as given below shall not be deliberately exceeded in any regime of flight (climb, cruise or descent) except for the purpose of pilot training or routine test flights in accordance with subsection 4.10 of the *AFM*. If the limits are inadvertently exceeded, speed shall be reduced to or below the limiting values as quickly as possible.

Maximum Operating Speed (V_{MO})

The following limits are placarded:

- Ventral fuel tank empty—Flaps 0° ..... 335 knots IAS up to 12,000 ft reducing by 1 knot per 680 ft to 310 knots IAS at 29,000 ft
- Ventral fuel tank not empty—Flaps 0° ..... 280 knots IAS

Maximum Operating Mach Number (M_{MO})

The following limit is placarded:

- M_{MO} ..... 0.80M indicated

Refer to Mach trim fail/inoperative limitation.



Airbrakes Open

- Flaps 0° Only ..... No limit

MANEUVERING SPEED (V_A)

Maneuvering speed (V_A) is 196 knots IAS.

Maneuvers, involving angles of attack near to the dynamic stall, full application of elevator, aileron or rudder controls, shall not be undertaken when the airspeed is greater than V_A.

WING FLAPS EXTENDED SPEED (V_{FE})

The maximum permissible airspeeds for extending the wing flaps and for flight with the flaps extended are given in Table LIM-7 for various flap settings. Limits for V_{FE}, landing gear operating speed (V_{LO}), landing gear extended speed (V_{LE}), and bird strike speed are all placarded.

PROCEDURAL USE OF FLAPS 15° FOR DESCENT AND HOLDING

The maximum airspeed for procedural use of flaps 15° for descent and holding is 220 knots IAS. The maximum altitude for this use is 15,000 feet. This use of wing flaps is not permitted in icing conditions.

LANDING GEAR OPERATING SPEED (V_{LO})

The maximum permissible airspeed for extending or retracting the landing gear is 220 knots IAS.

LANDING GEAR EXTENDED SPEED (V_{LE})

Maximum speed for flight with gear extended is 220 knots IAS.

BIRD STRIKE SPEED

- Under normal conditions, the maximum permissible airspeed to meet bird strike requirements is 280 knots IAS up to 8,000 feet.

- Following an aircraft ground soak at temperatures below –10°C, the windscreen heat should be operative and selected ON for a minimum of 5 minutes prior to takeoff in ambient temperatures of below –10°C, and for a minimum of 15 minutes prior to takeoff when ambient temperatures are below –20°C.

- If the minimum times for windscreen heat operation have not been achieved or in the case of windscreen heat failure followed by flight in ambient temperatures below –10°C, the maximum permissible airspeed is 257 knots IAS up to 8,000 feet.

MACH TRIM FAIL/INOPERATIVE

The maximum permissible Mach number with the Mach trim system inoperative is 0.73M indicated unless the autopilot is engaged.

Table LIM-7. MAXIMUM AIRSPEEDS WITH EXTENDING WING FLAPS

FLAP SETTING	MAXIMUM SPEED (KNOTS IAS)
15°	220
25°	175
45°	165

MISCELLANEOUS LIMITATIONS

MANEUVERING LOAD FACTOR LIMITATIONS

Operation is limited to normal flying maneuvers. Aerobatic maneuvers are not permitted. The maximum accelerations (i.e. load factors) for which the structure is approved are 2.0g with flaps extended and 2.73g with flaps fully retracted.

Maneuvers exceeding these values can cause permanent distortion of the structure and must be avoided.

MINIMUM FLIGHT CREW

The minimum crew is two pilots.

CREW SEATS

Both crew seats shall be locked in position during takeoff and landing. When fitted and in use, the supernumerary seat shall be locked in position; when not in use, it shall be folded and stowed or removed from the aircraft.

NUMBER OF OCCUPANTS

The total number of persons carried shall not exceed 17, nor that for which approved seating accommodation is provided.

INTERCOMPARTMENT DOOR

When a door is provided between the crew and passenger compartments, it shall be secured in the open position during takeoff and landing.

SMOKING

When the airplane is being operated in the Transport Category (Passenger), smoking in the toilet compartment is prohibited.

Placards summarizing this limitation shall be provided inside and outside each toilet. The placards shall not be obscured.

MAXIMUM PERMISSIBLE ALTITUDE

- Maximum permissible operating altitude is 41,000 feet.
- Maximum permissible altitude with flaps lowered or landing gear extended is 20,000 feet.

CABIN PRESSURE

The cabin shall not be pressurized during takeoff and landing. Maximum pressure differential for normal operations is 8.55 psi.

NOTE

The safety valve is set to operate between 8.6 to 8.8 psi.

ELECTRICAL SYSTEM

Battery Limitation

Minimum battery temperature for takeoff is –10°C (Nicad only). Maximum battery charge immediately before takeoff shall not be greater than 20 amps.

Generator Limitation

Maximum continuous engine generator load is 300 amps.

NOTE

Transient excursions above this limit are permitted for a maximum of 2 minutes.

Main Engine Starter Duty Cycle

The maximum permitted starter operating time is 30 seconds. After an aborted start, a minimum of 1-minute cooling time must be allowed before making another attempt to start. A further 1 minute is required before making a third attempt. The cycle may be repeated after a further period of 30 minutes.

Operation of Electrical Circuit Breakers

If, during flight, a systems failure is accompanied by a circuit-breaker operation, no attempt must be made to reset the circuit breaker unless specified in the appropriate Emergency or Abnormal procedure.

WHEEL BRAKES

The waiting period given in subsection 4.10 of the *AFM* for wheel brake cooling must be observed.

NOSEWHEEL TIRES

The aircraft must be fitted with chined nosewheel tires.

FLIGHT CONTROLS

Airbrakes

In flight, the airbrakes must not be operated when the flaps are extended to any position.

Lift Dump

Lift dump is to be used only when the aircraft is on the ground.

Rudder Bias

The rudder bias switches must be ON and the systems operative during each takeoff.

CABIN EMERGENCY OVERWING EXIT

The internal cabin emergency overwing exit locking pin, if fitted, must be removed and stowed before the commencement of each flight.

HONEYWELL DFZ-800 DUAL FLIGHT CONTROL SYSTEM

Normal operating procedures for the DFZ-800 Digital Flight Control System outlined in the Honeywell SPZ-8000 Digital Integrated Flight Control System Pilot's Manual, Publication A28-1146-059-02 dated April 1989, revised September 1994, or later revision, must be immediately available to the flight crew at all times.

Normal operating procedures for the LASEREF II Inertial Reference System outlined in the Honeywell LASEREF II Pilot's Manual, Publication 95-8351 dated 12/15/86, or later revision, must be immediately available to the flight crew at all times if installed.

Normal operating procedures for the LASEREF III Inertial Reference System outlined in the Honeywell LASEREF III Pilot's Manual, Publication M28-3343-001, Rev 1 dated 4/01/92, or later revision, must be immediately available to the flight crew at all times if installed.

NOTE

The dual AHZ-600 AHRS required by item 1 of this section may be replaced by items 2 or 3 of this section.

The maximum speed for autopilot operation is unchanged from the airplane maximum airspeed limit (V_{MO}/M_{MO}).

Do not use the autopilot or yaw damper during takeoff or landing.

A/P – Y/D engagement is prohibited if the aircraft is dispatched with only one Heading/Attitude source or one DADC operational. (Autopilot and Yaw Damper may be used if one Heading/Attitude Source or one DADC fails in flight).

Do not use the AHRS for navigation (attitude and heading) after a complete power loss of more than 2–3 minutes in flight.

Do not engage the yaw damper prior to reaching 400 feet above terrain after takeoff.

The aircraft is certified for Category II Coupled ILS approaches provided the equipment listed below is installed and operating:

A. The equipment required by the Pilot's Manual in item1 of this section.

B. Dual Sperry RNZ-850 ILS NAV Receivers.

CAT II approaches must be executed while coupled to the autopilot with the following limits:

Runway Visual Range (RVR)	1,200 ft. Minimum
Decision Height (DH)	100 ft. Minimum
Headwind	20 kts.
Crosswind	10 kts.
Tailwinds	10 kts.
Autopilot must be disengaged at	100 ft.

NOTE

Flight director manual approaches are limited to CAT I minimums.

If the Autopilot malfunctions/disengages below 1000 feet AGL, the Category II approach must be discontinued.

All sensor data (reversionary switches) must be normalized (green) for Category II approaches.

Navigation is not certified and performance is degraded if the IRU is aligned at latitudes above 78.25°.



MANEUVERS AND PROCEDURES

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MANEUVERS AND PROCEDURES

DEPARTURE

TAXI

The aircraft may be taxied on normal hard areas. Directional control is normally exercised by nosewheel steering but differential wheel braking is available in the event of nosewheel steering failure.

Figure MAP-1 shows the minimum turning radii.

NOTE

The nosewheel steering should not be moved while the aircraft is stationary.

During taxi, test the rudder bias system as described in the *Crew Manual, Volume 3, Expanded Normal Checklist, Before Takeoff Checks*.

Turn both rudder bias switches OFF, advance the No. 1 thrust lever. Select RUDDER BIAS switch A (ON then OFF) and then switch B (ON then OFF), checking that the rudder bias system moves the rudder towards the higher powered engine and then retard the thrust lever. Repeat the procedure for engine No. 2.

Reset both switches to ON, replace guards and check RUDDER BIAS warning light is OFF.

When taxiing in snow or slush, it is recommended that brake applications be made to allow the residual heat, in the brake friction pact, to dispose of any slush accumulation in the brake units.

THRUST REVERSERS

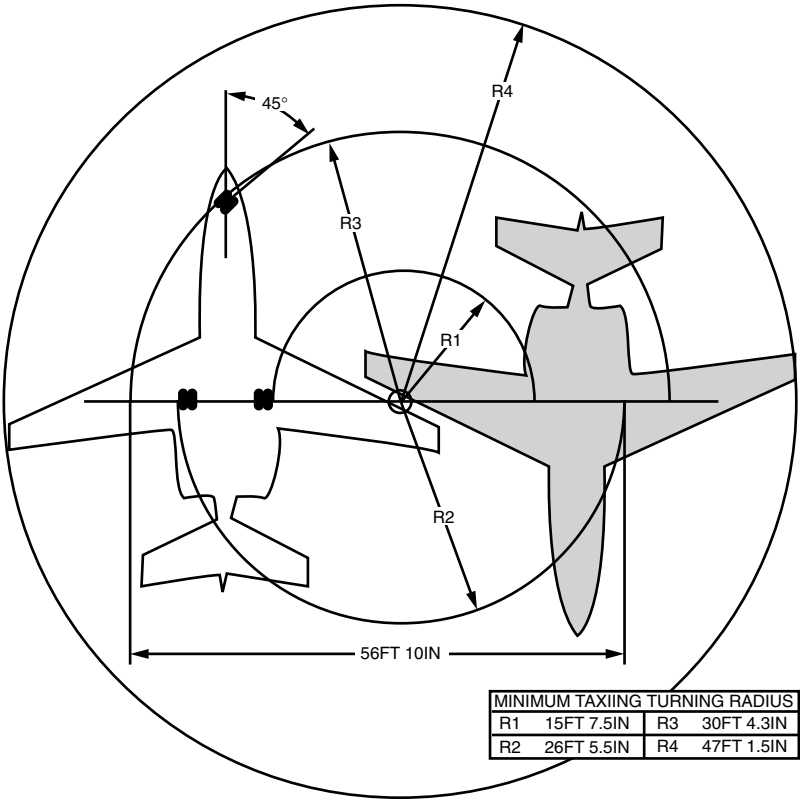
Before the first flight of the day, the thrust reversers and associated annunciators should be checked for correct operation.

During taxi, test the thrust reversers as described in the *Crew Manual, Volume 3, Expanded Normal Checklist, Before Takeoff Checks.*

If the thrust reverser system is known to be inoperative or not serviceable, it must be disabled and locked in the forward thrust position. Reverse thrust is only to be used when the main and nose gears are on the ground.

Movement of the thrust levers above IDLE is inhibited during thrust reverser deployment and stowage, the UNLCK annunciators will come on when the thrust reverser doors are not locked in the stowed position. When the thrust reverser doors are fully deployed the REVSR annunciator will come on and, the UNLCK annunciator will remain on.

Maximum reverse thrust is automatically controlled at approximately 65% N_1.



MINIMUM TAXIING TURNING RADIUS			
R1	15FT 7.5IN	R3	30FT 4.3IN
R2	26FT 5.5IN	R4	47FT 1.5IN

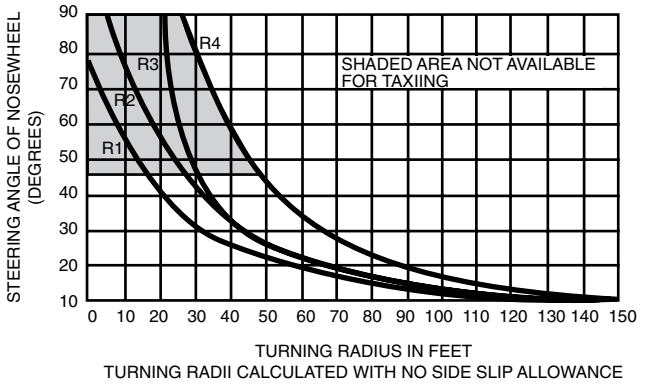


Figure MAP-1. Minimum Turn Radii



TYPE OF RUNWAY SURFACE

Wet Runway

A runway is considered as wet when it is well soaked but without significant areas of standing water.

A runway is considered well soaked when there is sufficient moisture on the runway surface to cause it to appear reflective.

Slippery Runway

A slippery runway is one which is either covered by compacted snow or is expected to have very low braking action due to the presence of wet ice. The coefficient of friction is: μ=0.15.

NOTE

A runway referred to as slippery, under these conditions, is extremely more slippery than a wet runway.

Compacted snow is snow which has been compressed into a solid mass which resists further compression and will hold together or break into lumps if picked up. The *Aircraft Flight Manual, Subsection 5.20*, provides data for operation on slippery runways.

OPERATION ON UNPAVED SURFACES

Paved runways are those having a prepared hard surface such as concrete or tarmac. Unpaved runways are those categorized into natural, grass, and gravel runways.

NOTE

Takeoff from an unpaved runway with an uphill slope of more than 1.0% is not permitted.

Before operating on unpaved surfaces, the aircraft should have the rough field modifications installed. These modifications give protection to the flaps and the under-fuselage beacons and antennae.

Operation on natural grass and gravel runways is satisfactory if the surface is hard, no ruts or major surface irregularities, and there are no large loose stones. Some minor paint chipping can be expected from small stones thrown up by the nosewheels, but large stones may cause dents.

If possible, the pilot should inspect the runway surface before using it.

Tire wear will increase if heavy braking is used, particularly on grave surfaces. Even if only light braking is used, the tires should be visually inspected before each flight.

On unpaved surfaces, it may be desirable to reduce the tire pressures. It is recommended that the aircraft should not be operated on a surface where the tires leave ruts. If ruts are formed, the tire pressure should be reduced as much as possible.

NOTE

Operation from unpaved runways may be subject to the approval of the local airworthiness authorities.

Takeoff and landing techniques are similar to those for paved runways, subject to the following:

- Refer to the appropriate Supplement in the *Aircraft Flight Manual* for categories of unpaved runway from which the aircraft is certified to operate.
- Upon landing, heavy braking should be avoided.
- Thrust reversers may be deployed, but should not be used at more engine thrust than reverse idle, except in an emergency.
- After landing, the tires must be inspected for damage.

MINIMUM RUNWAY WIDTH

It has been demonstrated that, in zero crosswind, the maximum deviation from the intended takeoff line caused by failure of an engine during takeoff can, with prompt corrective action, be limited to 30 ft.

When deciding the minimum runway width necessary for a safe takeoff, allowance should be made for the dimensions of the aircraft and a safety margin should be included.

Wind Component

Refer to the *Aircraft Flight Manual: Subsection 5.05.*

Critical Engine

Refer to the *Aircraft Flight Manual: Subsection 5.05.*

TAKEOFF

Refer to the *Aircraft Flight Manual: Subsection 4.10.*

Refer to Figure MAP-2 for a flight profile for normal takeoff.

The APR can be armed prior to setting, or while setting, takeoff power (white APR ARMED legend will come on) however, if the engines do not accelerate together, the APR may operate.

Therefore, it is the normal recommended practice to arm the APR after takeoff power has been set.

A flap setting of 15° is recommended unless performance is limited.

NOTE

The yaw damper must not be engaged for takeoff.

After takeoff, the yaw damper may be engaged but must be disengaged before touchdown.

TAKEOFF THRUST

Refer to the *Aircraft Flight Manual: Subsection 4.10.*

The allowance of 1% N_1 at 80 KIAS does not imply that an engine is satisfactory if it consistently fails to meet $N_{1\,REF}$ at 80 KIAS.

The atmospheric conditions, particularly temperature, may be slightly different from those used when calculating $N_{1\,REF}$. Therefore, some tolerance around $N_{1\,REF}$ is necessary.

If an engine is 1% below $N_{1\,REF}$ at 80 KIAS, the airspeed effect will make it more than 1% below at higher speeds. Also, the higher the speed at which takeoff is abandoned, the higher the risk to the aircraft and occupants.

For that reason, in the absence of any other emergency and both engines are producing all or nearly all of their takeoff thrust, it is probably better to continue a takeoff rather than abandon it. Therefore, the figure of 2% is given as a guideline above 80 knots.

Noise Abatement Procedures

Refer to the *Aircraft Flight Manual: Subsection 5.05.*

1. MAINTAIN 160 KIAS TO HEIGHT REQUIRED FOR OBSTACLE CLEARANCE AND/OR FOR NOISE ABATEMENT — THEN ACCELERATE.
2. DISARM APR WHEN OBSTACLES CLEARED V_{FTO} IS ATTAINED AND FLAPS ARE UP.
3. AT LOW WEIGHTS DO NOT EXCEED 20° PITCH ATTITUDE — ALLOW ACCELERATION IF 20° IS REACHED.

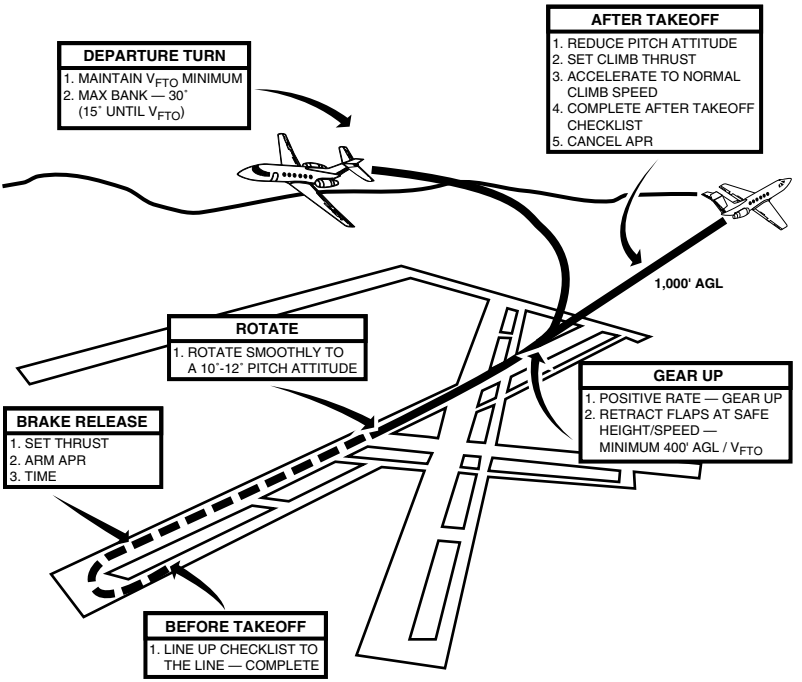

DEPARTURE TURN
1. MAINTAIN V_{FTO} MINIMUM
2. MAX BANK — 30° (15° UNTIL V_{FTO})
AFTER TAKEOFF
1. REDUCE PITCH ATTITUDE
2. SET CLIMB THRUST
3. ACCELERATE TO NORMAL CLIMB SPEED
4. COMPLETE AFTER TAKEOFF CHECKLIST
5. CANCEL APR
1,000' AGL
ROTATE
1. ROTATE SMOOTHLY TO A 10°-12° PITCH ATTITUDE
GEAR UP
1. POSITIVE RATE — GEAR UP
2. RETRACT FLAPS AT SAFE HEIGHT/SPEED — MINIMUM 400' AGL / V_{FTO}
BRAKE RELEASE
1. SET THRUST
2. ARM APR
3. TIME
BEFORE TAKEOFF
1. LINE UP CHECKLIST TO THE LINE — COMPLETE

Figure MAP-2. Normal Takeoff

Table MAP-1. N_1 REFERENCE VALUES FOR MAXIMUM CLIMB ENGINE ANTI-ICING OFF, SYNC ON

ALTITUDE FT	TEMPERATURE °C																		
	–55	–50	–45	–40	–35	–30	–25	–20	–15	–10	–5	0	5	10	15	20	25	30	35	40
43,000	98.7	99.8	100.0	100.0	100.0	99.2	98.3	97.4	96.6											
41,000	98.7	99.8	100.0	100.0	100.0	99.7	98.8	98.0	97.1											
40,000	98.7	99.8	100.0	100.0	100.0	100.0	99.0	98.3	97.4	96.5										
35,000	98.7	99.8	100.0	100.0	100.0	100.0	100.0	99.3	98.3	97.4	96.6									
30,000	98.6	99.7	100.0	100.0	100.0	100.0	100.0	100.0	99.1	98.2	97.3	96.5	95.6							
25,000	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.4	98.8	98.2	97.4	96.6	95.6						
20,000	98.3	98.3	98.3	98.3	98.3	98.3	98.3	98.2	97.4	96.9	96.4	95.8	95.2	94.4	93.6	92.6				
15,000	98.3	98.3	98.3	98.3	98.3	98.3	98.3	98.3	98.2	97.4	96.7	96.0	95.3	94.5	93.8	92.9	91.9	90.8		
10,000	89.3	90.3	91.3	92.3	93.3	94.2	95.2	96.2	97.2	98.1	97.6	96.9	96.3	95.5	94.8	94.0	93.1	92.1	90.9	
5,000	82.9	83.8	84.8	85.8	86.7	87.7	88.6	89.5	90.4	91.3	92.2	93.1	93.9	94.8	94.9	94.1	93.2	92.2	91.0	89.8
SEA LEVEL	77.6	78.5	79.4	80.3	81.2	82.1	83.0	83.8	84.7	85.5	86.4	87.2	88.0	88.8	89.6	90.4	91.2	92.0	91.0	89.7

Table MAP-2. N_1 REFERENCE VALUES FOR MAXIMUM CLIMB ENGINE ANTI-ICING ON, SYNC ON

ALTITUDE FT	TEMPERATURE °C														
	–55	–50	–45	–40	–35	–30	–25	–20	–15	–10	–5	0	5	10	15
43,000	98.7	99.2	99.1	98.9	98.5	97.5	96.8	96.2	95.2						
41,000	98.7	99.4	99.6	99.8	99.2	98.2	97.5	96.7	95.8						
40,000	98.7	99.8	100.0	100.0	99.5	98.6	97.8	96.9	96.1	95.3					
35,000	98.7	99.8	100.0	100.0	100.0	99.3	98.6	97.8	96.9	95.9	95.1				
30,000	98.6	99.7	100.0	100.0	100.0	99.9	99.2	98.5	97.7	96.7	95.8	95.0	94.1		
25,000	100.0	100.0	100.0	100.0	100.0	99.5	98.9	98.4	97.9	97.3	96.7	95.9	95.1	94.1	
20,000	98.3	98.3	98.3	98.3	98.3	98.1	97.2	96.6	95.9	95.4	94.9	94.3	93.7	92.8	92.0
15,000	98.3	98.3	98.3	98.3	98.3	98.3	98.2	97.5	96.7	95.9	95.2	94.5	93.8	93.0	92.1
10,000	89.3	90.3	91.3	92.3	93.3	94.2	95.2	96.2	97.2	97.0	96.1	95.4	94.8	94.0	93.2
5,000	82.9	83.8	84.8	85.8	86.7	87.7	88.6	89.5	90.4	91.3	92.2	93.1	93.9	94.1	93.3
SEA LEVEL	77.6	78.5	79.4	80.3	81.2	82.1	83.0	83.8	84.7	85.5	86.4	87.2	88.0	88.8	89.6

CLIMB

Refer to Figure MAN-3 for a flight profile for climb, cruise, and descent.

For the following procedures, refer to the *CM 800 XP V2 Crew Manual, Volume 2, PERFORMANCE.*

Climb fuel, distance and time are tabulated versus takeoff weight and altitude at top of climb. The data is presented for temperatures in the range from ISA –15° C to ISA +20° C.

Tables are presented for two climbs:

- Normal Procedure Climb ..... Subsection 2-3-1

The Normal Procedure Climb continues at 250 KIAS to 32,000 ft at which IMN=0.70. The final part of the climb to cruise altitude is at IMN=0.70.

- Optimum Time-to-Height Procedure Climb ..... Subsection 2-3-2

- Optimum Time-to-Height Procedure Climb continues at 250 KIAS to 28,000 ft at which IMN=0.63. The final part of the climb to cruise altitude is at IMN=0.63.

Both climb procedures include time and fuel allowances for takeoff and initial climb to 160 KIAS at 1,000 ft, but no distance is credited for this initial climb. The procedures then accelerate to 250 KIAS at 5,000 ft and continue to 10,000 ft at this speed. Maximum climb thrust is set by adjusting the thrust levers until the green lights in the ITT gages are lit.

NOTE

When using the lights in the ITT gage to set max climb rating, the achieved N1 should not be more than 1% below the chart value.

Deviation from the chart value is dependent on individual engine compensation levels and the accuracy of the aircraft systems.

Refer to Tables MAP-1 and MAP-2 for chart values.

The pilots need not check the maximum climb rpm against the chart unless they believe that climb thrust is not being achieved. Set climb power as soon as convenient after raising the flaps and landing gear, or after the completion of a noise abatement procedure, and allow the aircraft to accelerate to achieve the recommended climbing speed at 2,000 to 3,000 ft.

If rate of climb is not important, a power lower than maximum climb power may be used.

When cruising height is reached, allow the aircraft to accelerate to cruising speed and reduce power to within the cruise rating. In some conditions, the initial cruising speed may be below the climbing speed.

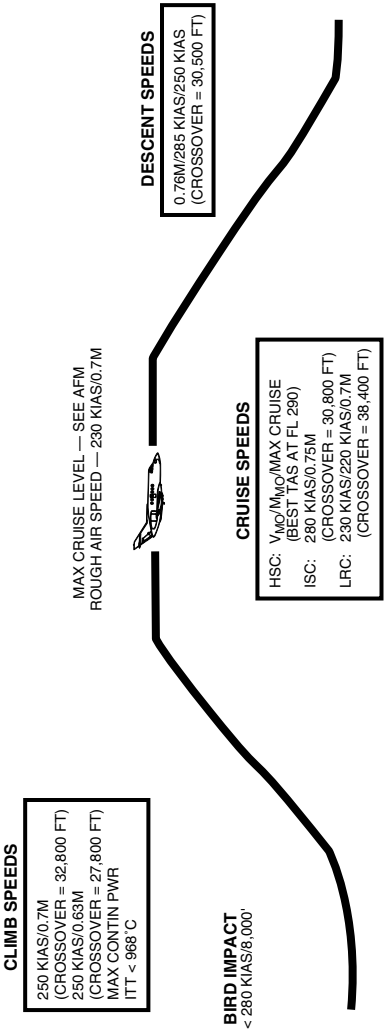


Figure MAP-3. Climb, Cruise and Descent

CRUISE

Refer to Figure MAP-3 for a Flight Profile—Climb, Cruise, and Descent.

The maximum cruising speed is limited by V_{MO}, M_{MO}, or maximum cruise rating.

The recommended intermediate cruising speed is:

- 280 KIAS up to 29,000 ft.
- 0.75 MIND at 31,000 ft and above.

The recommended long range cruising speed is:

- 230 KIAS up to 35,000 ft.
- 220 KIAS at 37,000 ft.
- 0.70 MIND at 39,000 ft and above.

The *Crew Manual, Volume 2* contains performance data related to the above procedures.

Thrust should be adjusted as required to achieve these speeds and any thrust setting up to maximum recommended cruise thrust may be used.

On most occasions, N_1 rpm will be the operating restriction and should be periodically checked and reset if necessary, especially after a change of altitude or IOAT.

Where the highest practicable cruising altitude is required, the cruise may be started at a speed below 220 KIAS or 0.70 MIND and the aircraft may be allowed to accelerate as weight decreases, maintaining maximum cruising thrust until the desired speed is reached.

The *Crew Manual, Volume 2* gives the maximum cruising altitude against weight and temperature, together with the IAS on which they are based.

These speeds are the lowest at which the aircraft will cruise comfortably and no attempt should be made to cruise slower.

FLIGHT IN TURBULENT AIR OR ICING CONDITIONS

Refer to the *Aircraft Flight Manual, Subsection 4.10* or *Crew Manual, Volume 3, Section 5, ADVERSE CONDITIONS.*



Table MAP-3. TAKEOFF N_1 REFERNCE VALUES FOR APR ARMED (NOT OPERATING)–CABIN AIR OFF, ENGINE ANTI-ICE OFF

ALTITUDE FT	OUTSIDE AIR TEMPERATURE °C										
	–50	–45	–40	–35	–30	–25	–20	–15	–10	–5	0
15,000	98.7	99.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
14,000	98.7	99.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
13,000	98.7	99.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
12,000	98.7	99.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
11,000	98.7	99.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
10,000	98.7	99.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
9,000	98.1	99.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
8,000	96.1	97.1	98.1	99.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0
7,000	93.9	95.0	96.0	97.0	98.0	99.0	99.9	100.0	100.0	100.0	100.0
6,000	92.2	93.2	94.2	85.2	96.2	97.2	98.1	99.1	100.0	100.0	100.0
5,000	90.7	91.7	92.7	93.7	94.7	95.6	96.6	97.5	98.5	99.4	100.0
4,000	89.4	90.4	91.4	92.3	93.3	94.2	95.2	96.1	97.0	97.9	98.8
3,000	88.1	89.1	90.0	91.0	91.9	92.9	93.8	94.7	95.6	96.5	97.4
2,000	86.8	87.7	88.7	89.7	90.6	91.5	92.4	93.3	94.2	95.1	96.0
1,000	85.6	86.6	87.5	88.4	89.3	90.2	91.1	92.0	92.9	93.8	94.7
SEA LEVEL	84.4	85.4	86.3	87.2	88.1	89.0	89.9	90.8	91.6	92.5	93.4
–1,000	83.4	84.3	85.2	86.1	87.0	87.9	88.8	89.7	90.5	91.4	92.2

ALTITUDE FT	OUTSIDE AIR TEMPERATURE °C										
	0	5	10	15	20	25	30	35	40	45	50
15,000	100.0	99.4	98.7	97.8	97.0	0.0	0.0	0.0	0.0	0.0	0.0
14,000	100.0	99.5	98.7	97.9	97.1	0.0	0.0	0.0	0.0	0.0	0.0
13,000	100.0	99.5	98.7	97.9	97.1	0.0	0.0	0.0	0.0	0.0	0.0
12,000	100.0	99.5	98.8	98.0	97.1	96.2	0.0	0.0	0.0	0.0	0.0
11,000	100.0	99.6	98.8	98.0	97.2	96.2	0.0	0.0	0.0	0.0	0.0
10,000	100.0	99.6	98.8	98.1	97.3	96.3	95.1	0.0	0.0	0.0	0.0
9,000	100.0	99.6	98.9	98.1	97.3	96.4	95.2	0.0	0.0	0.0	0.0
8,000	100.0	99.6	98.9	98.1	97.3	96.4	95.3	94.1	0.0	0.0	0.0
7,000	100.0	99.6	98.9	98.1	97.3	96.4	95.3	94.1	9.28	0.0	0.0
6,000	100.0	99.7	98.9	98.1	97.4	96.5	95.3	94.1	92.8	0.0	0.0
5,000	100.0	99.7	99.0	98.2	97.4	96.5	95.4	94.1	92.8	91.5	0.0
4,000	98.8	99.7	99.0	98.2	97.4	96.5	95.4	94.2	92.9	91.5	0.0
3,000	97.4	98.3	99.0	98.2	97.4	96.5	95.4	94.2	92.9	91.5	90.2
2,000	96.0	96.8	97.7	98.2	97.4	96.6	95.4	94.2	92.9	91.5	90.2
1,000	94.7	95.5	96.4	97.2	97.5	96.6	95.5	94.3	93.0	91.6	90.2
SEA LEVEL	93.4	94.2	95.0	95.9	96.7	96.6	95.5	94.3	93.0	91.6	90.2
–1,000	92.2	93.1	93.9	94.7	95.5	96.3	95.5	94.3	93.0	91.6	90.2

Table MAP-4. TAKEOFF N_1 REFERNCE VALUES FOR APR ARMED (NOT OPERATING)–CABIN AIR OFF, ENGINE ANTI-ICE ON

ALTITUDE FT	OUTSIDE AIR TEMPERATURE °C												
	–50	–45	–40	–35	–30	–25	–20	–15	–10	–5	0	5	10
15,000	98.7	99.8	100.0	100.0	100.0	100.0	100.0	100.0	99.7	99.0	98.3	97.6	96.8
14,000	98.7	99.8	100.0	100.0	100.0	100.0	100.0	100.0	99.8	99.1	98.4	97.6	96.9
13,000	98.7	99.8	100.0	100.0	100.0	100.0	100.0	100.0	99.8	99.1	98.4	97.7	96.9
12,000	98.7	99.8	100.0	100.0	100.0	100.0	100.0	100.0	99.8	99.2	98.5	97.7	97.0
11,000	98.7	99.8	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.2	98.5	97.8	97.0
10,000	98.7	99.8	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.2	98.5	97.8	97.0
9,000	98.1	99.3	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.3	98.6	97.8	97.1
8,000	96.1	97.1	98.1	99.1	100.0	100.0	100.0	100.0	100.0	99.3	9-8.6	97.9	97.1
7,000	93.9	95.0	96.0	97.0	98.0	99.0	99.9	100.0	100.0	99.3	98.6	97.9	97.1
6,000	92.2	93.2	94.2	85.2	96.2	97.2	98.1	99.1	100.0	99.4	98.6	97.9	97.1
5,000	90.7	91.7	92.7	93.7	94.7	95.6	96.6	97.5	98.5	99.4	98.7	97.9	97.2
4,000	89.4	90.4	91.4	92.3	93.3	94.2	95.2	96.1	97.0	97.9	98.7	98.0	97.2
3,000	88.1	89.1	90.0	91.0	91.9	92.9	93.8	94.7	95.6	96.5	97.4	98.0	97.2
2,000	86.8	87.7	88.7	89.7	90.6	91.5	92.4	93.3	94.2	95.1	96.0	96.8	97.3
1,000	85.6	86.6	87.5	88.4	89.3	90.2	91.1	92.0	92.9	93.8	94.7	95.5	96.4
SEA LEVEL	84.4	85.4	86.3	87.2	88.1	89.0	89.9	90.8	91.6	92.5	93.4	94.2	95.0
–1,000	83.4	84.3	85.2	86.1	87.0	87.9	88.8	89.7	90.5	91.4	92.2	93.1	93.9

MANEUVERING AT HIGH ALTITUDES

Refer to the *Aircraft Flight Manual, Section 2, LIMITATIONS.*

At mach numbers greater than about 0.7, the buffet onset boundary is defined by an agitation of the ailerons which can be felt through the control column.

At lower mach numbers, the boundary is defined by airframe buffet.

STABILITY AND TRIM CHANGE

Small amplitude dutch roll may occur and can be easily corrected by small aileron movements or, more effectively, by the use of the yaw damper.

NOTE

The yaw damper also increases directional stability during turbulence.

Changes of trim with power, landing gear, and airbrakes are small. There is a nosedown change of trim as the flaps are extended, becoming distinctive beyond 25°.

The aircraft may require a small but increasing amount of lateral trim, particularly when changing airspeeds above 0.6 mach number. Care should be taken to monitor the trim indicator throughout the flight.

If necessary, centralize the aileron trim indicator by use of the aileron trimmer. The rudder trim should be adjusted to give zero sideslip. In cases of gross mistrim, the AIL mistrim annunciator will come on.

NOTE

Centralize the trim indicator before disconnecting the autopilot.

RUDDER CONTROL FORCE

A load is imposed on the rudder control by a spring strut.

On the ground for small deflections, this load is masked by circuit friction and the force required to initiate rudder movement is light, but as the control surface is moved towards full deflection, the required force becomes progressively greater until, to obtain full movement, a foot force of approximately 65 lb has to be applied.

Two pneumatic rudder bias struts are provided in order to reduce the control forces necessary in maintaining unyawed flight after the failure of one engine.

NOTE

Identification of the inoperative engine may not be evident from flight characteristics alone.

Before takeoff, check the RUDDER BIAS switches are selected ON and check the RUDDER BIAS annunciator is off. Rudder bias is inhibited when thrust reverse is selected.

AIRBRAKES

The airbrakes may be extended at any airspeed in flight. They must not be used when the flaps are extended except when the aircraft is on the ground.

POSITION ERROR CORRECTIONS

Refer to the *Aircraft Flight Manual, Subsection 5.05.*

FLIGHTS IN EXCESS OF M_{MO} AND FLIGHTS IN EXCESS OF V_{MO}

Refer to the *Aircraft Flight Manual, Subsection 4.10.*

Stalls

Refer to the *Aircraft Flight Manual, Subsection 4.10.*

AUTOPILOT AND NAVIGATION

Refer to the *Aircraft Flight Manual, Subsection 4.10.*

Navigation

Flight Management System

NOTE

The flight management system present position coordinates are to be checked for acceptable accuracy before the aircraft flies beyond the range of reliable ground navaids.

All data insertions, including ramp coordinates previously inserted into the flight management system should be recalled and verified preferably by another member of the aircrew.

The verification should include a comparison of the displayed distances between waypoints and the distances shown on the flight plan.

The installed long range navaids (IRUs, GPS, etc.) should be checked against the FMS position while still in DME coverage before any oceanic crossing. Any FMS messages concerning navigation aid accuracy should be investigated. Refer to the relevant flight management system manual.

NOTE

If there is any doubt as to the correct position, the controlling authority should be informed, particularly on an oceanic flight.

The flight management system should be carefully monitored throughout the flight to make certain that present position and planned forward flight path satisfies the clearance which is currently effective.

On oceanic flights, and other remote areas, the monitoring procedures should include a routine check of indicated position about 10 minutes after passing each waypoint.

In the vicinity of the equator or prime meridian, care must be taken to make sure that the coordinates of data inserts are correctly designated (N/S, E/W).

ICE AND RAIN PROTECTION SYSTEMS

Refer to the *Aircraft Flight Manual, Subsection 4.10.*

DESCENT

Refer to Figure MAP-4 for a flight profile for ILS.

Descent procedures are based on the requirement that cabin rate of descent should not exceed approximately 300 feet per minute.

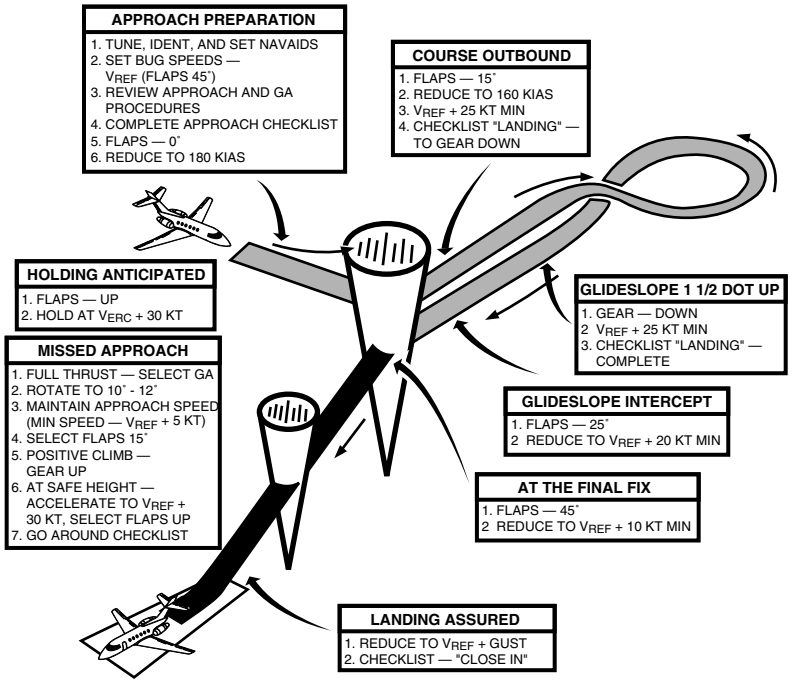

APPROACH PREPARATION
1. TUNE, IDENT, AND SET NAVAIDS
2. SET BUG SPEEDS — VREF (FLAPS 45˚)
3. REVIEW APPROACH AND GA PROCEDURES
4. COMPLETE APPROACH CHECKLIST
5. FLAPS — 0˚
6. REDUCE TO 180 KIAS
COURSE OUTBOUND
1. FLAPS — 15˚
2. REDUCE TO 160 KIAS
3. VREF + 25 KT MIN
4. CHECKLIST "LANDING" — TO GEAR DOWN
HOLDING ANTICIPATED
1. FLAPS — UP
2. HOLD AT VERC + 30 KT
MISSED APPROACH
1. FULL THRUST — SELECT GA
2. ROTATE TO 10˚ - 12˚
3. MAINTAIN APPROACH SPEED (MIN SPEED — VREF + 5 KT)
4. SELECT FLAPS 15˚
5. POSITIVE CLIMB — GEAR UP
6. AT SAFE HEIGHT — ACCELERATE TO VREF + 30 KT, SELECT FLAPS UP
7. GO AROUND CHECKLIST
GLIDESLOPE 1 1/2 DOT UP
1. GEAR — DOWN
2 VREF + 25 KT MIN
3. CHECKLIST "LANDING" — COMPLETE
GLIDESLOPE INTERCEPT
1. FLAPS — 25˚
2 REDUCE TO VREF + 20 KT MIN
AT THE FINAL FIX
1. FLAPS — 45˚
2 REDUCE TO VREF + 10 KT MIN
LANDING ASSURED
1. REDUCE TO VREF + GUST
2. CHECKLIST — "CLOSE IN"

Figure MAP-4. ILS

Table MAP-5 shows the minimum time to descend.

Any descent technique which gives overall times close to these values may be used. If it is desired to use a high rate of descent for part of the way down, this must be balanced by a lower rate of descent at some other point to give a reasonable total time.

For fuel economy, it is best to use the lower rate of descent high up, and increase it at lower altitude. For maximum range, the descent procedure used is 0.76 M_{IND} down to 31,000 ft and 285 below, decelerating to 250 KIAS by 10,000 ft. Adequate supply of air to the cabin is obtained with engines idling and both MAIN AIR VALVES selected OPEN.

From altitudes above 37,000 ft the overall descent time, with power at idle, is too short and, unless some delay lower down is anticipated, the rate of descent above 37,000 ft should be reduced to about 1,000 ft per minute by increasing power. The data in *Volume 2* of the *Air Crew Manual* is based on this technique.

The use of rough air airspeed reduces rate of descent and increases sector fuel and time slightly. Airbrakes are not normally used but may be extended to steepen the descent at any time.

Table MAP-5. TIME OF DESCENT

Cruising Altitude Feet	Minimum Time of Descent to 15,000 Feet (In Minutes)
43,000	21 Minutes
41,000	19 Minutes
39,000	17 Minutes
37,000	15 Minutes
35,000	13 Minutes
33,000	11 Minutes
31,000	9 Minutes
29,000	7 Minutes
27,000	4 Minutes

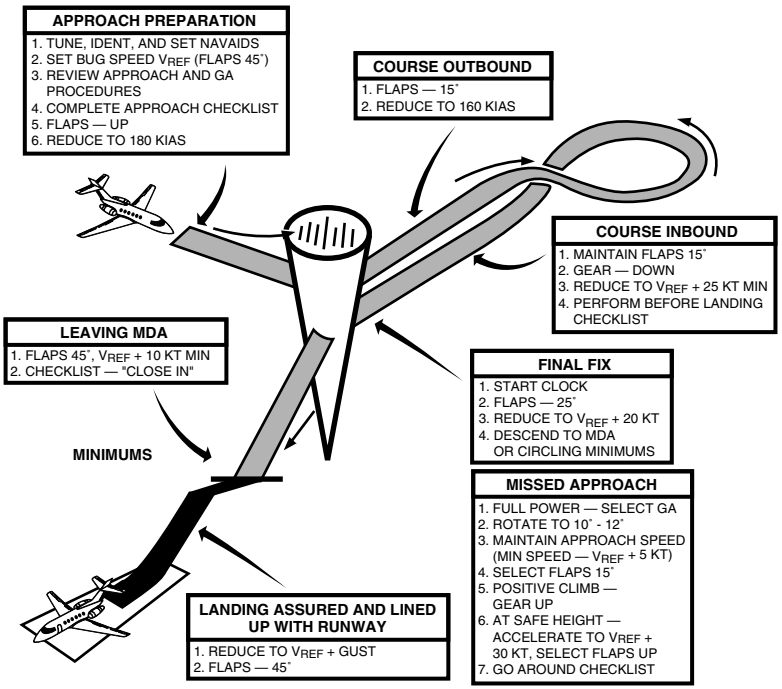
HOLDING

Holding in normal conditions, is carried out with the aircraft in a clean configuration.

Holding speeds are given in the *Air Crew Manual, Volume 2*.

Refer to Figure MAP-5 for a flight profile for nonprecision approach.

Refer to Figure MAP-6 for a flight profile for VFR approach normal.


APPROACH PREPARATION
1. TUNE, IDENT, AND SET NAVAIDS
2. SET BUG SPEED VREF (FLAPS 45˚)
3. REVIEW APPROACH AND GA PROCEDURES
4. COMPLETE APPROACH CHECKLIST
5. FLAPS — UP
6. REDUCE TO 180 KIAS
COURSE OUTBOUND
1. FLAPS — 15˚
2. REDUCE TO 160 KIAS
COURSE INBOUND
1. MAINTAIN FLAPS 15˚
2. GEAR — DOWN
3. REDUCE TO VREF + 25 KT MIN
4. PERFORM BEFORE LANDING CHECKLIST
LEAVING MDA
1. FLAPS 45˚, VREF + 10 KT MIN
2. CHECKLIST — "CLOSE IN"
FINAL FIX
1. START CLOCK
2. FLAPS — 25˚
3. REDUCE TO VREF + 20 KT
4. DESCEND TO MDA OR CIRCLING MINIMUMS
MINIMUMS
MISSED APPROACH
1. FULL POWER — SELECT GA
2. ROTATE TO 10˚ - 12˚
3. MAINTAIN APPROACH SPEED (MIN SPEED — VREF + 5 KT)
4. SELECT FLAPS 15˚
5. POSITIVE CLIMB — GEAR UP
6. AT SAFE HEIGHT — ACCELERATE TO VREF + 30 KT, SELECT FLAPS UP
7. GO AROUND CHECKLIST
LANDING ASSURED AND LINED UP WITH RUNWAY
1. REDUCE TO VREF + GUST
2. FLAPS — 45˚

NOTE:
FOR A CIRCLING APPROACH, MAINTAIN CONFIGURATION AND SPEED UNTIL CIRCLING IS COMPLETE

FLAP SETTING	0˚	15˚	25˚	45˚
MINIMUM MANEUVER SPEED	V_{REF} + 30 KT	V_{REF} + 25 KT	V_{REF} + 20 KT	V_{REF} + 10 KT
THRESHOLD SPEED	V_{REF} + 15 KT	V_{REF} + 10 KT	V_{REF} + 5 KT	V_{REF}

Figure MAP-5. Nonprecsion approach

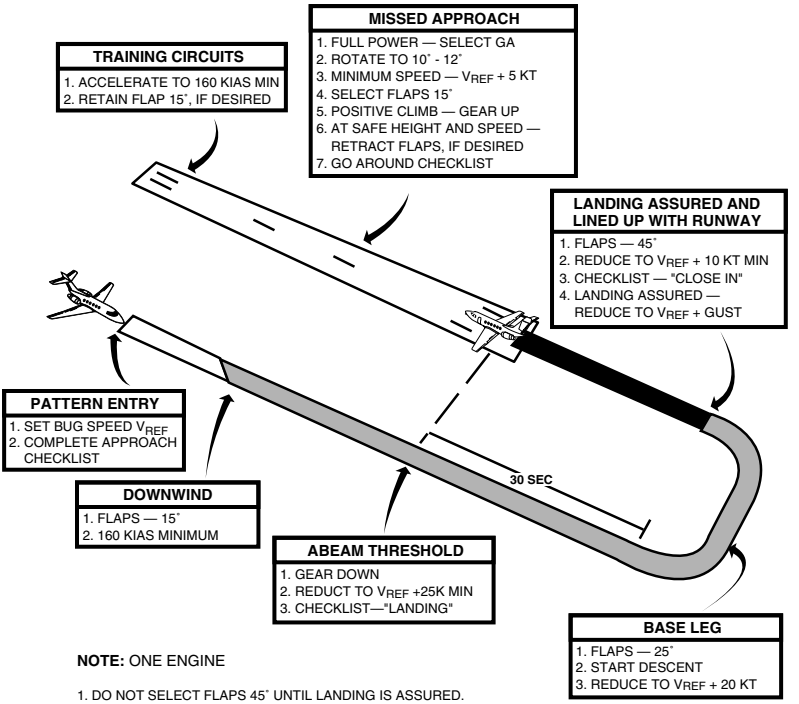
LANDING

Normal Landing

Refer to the *Aircraft Flight Manual, Subsection 4.10.*

Two Engine Go-around

Refer to the *Aircraft Flight Manual, Subsection 4.10.*


MISSED APPROACH
1. FULL POWER — SELECT GA
2. ROTATE TO 10˚ - 12˚
3. MINIMUM SPEED — VREF + 5 KT
4. SELECT FLAPS 15˚
5. POSITIVE CLIMB — GEAR UP
6. AT SAFE HEIGHT AND SPEED — RETRACT FLAPS, IF DESIRED
7. GO AROUND CHECKLIST
TRAINING CIRCUITS
1. ACCELERATE TO 160 KIAS MIN
2. RETAIN FLAP 15˚, IF DESIRED
LANDING ASSURED AND LINED UP WITH RUNWAY
1. FLAPS — 45˚
2. REDUCE TO VREF + 10 KT MIN
3. CHECKLIST — "CLOSE IN"
4. LANDING ASSURED — REDUCE TO VREF + GUST
PATTERN ENTRY
1. SET BUG SPEED VREF
2. COMPLETE APPROACH CHECKLIST
DOWNWIND
1. FLAPS — 15˚
2. 160 KIAS MINIMUM
30 SEC
ABEAM THRESHOLD
1. GEAR DOWN
2. REDUCT TO VREF +25K MIN
3. CHECKLIST—"LANDING"
BASE LEG
1. FLAPS — 25˚
2. START DESCENT
3. REDUCE TO VREF + 20 KT

NOTE: ONE ENGINE

1. DO NOT SELECT FLAPS 45˚ UNTIL LANDING IS ASSURED. RECOMMEND DECISION BE MADE BY 200' AGL.
2. APR MAY BE ARMED FOR THE APPROACH, IF DESIRED. (SINGLE ENGINE)

FLAP SETTING	0˚	15˚	25˚	45˚
MINIMUM MANEUVER SPEED	V_{REF} + 30 KT	V_{REF} + 25 KT	V_{REF} + 20 KT	V_{REF} + 10 KT
THRESHOLD SPEED	V_{REF} + 15 KT	V_{REF} + 10 KT	V_{REF} + 5 KT	V_{REF}

Figure MAP-6. VFR Approach Normal

Wheelbrakes

Refer to the *Aircraft Flight Manual, Subsection 4.10.*

Wheelbrake Landing WAT Limit

Part of the landing WAT limitations (*Aircraft Flight Manual, Section 5.45*, Figure 5.45.1) is determined by the wheelbrake energy requirement.

This requirement meets the case of a normal landing followed by a waiting period before the start of taxi-out, as described above.

For emergency situations, such as a landing at high weight immediately following an engine failure on takeoff, these landing brake limits do not apply. In these circumstances, the procedures are in the *Aircraft Flight Manual, Section 4.05.*

TAKEOFF

ENGINE FAILURE

Refer to Figures MAP-7 and MAP-8, in this section, for a flight profile for takeoff: engine failure after V_1 with APR-low and high performance profiles.

- Rejected Takeoff Before V_1
- Continued Takeoff (Engine Failure after V_1)
- Engine Failure After Liftoff
- Maximum Continuous Thrust (MCT) (Single Engine)
- Setting MCT After Engine Failure on Takeoff
- Method of Setting Enroute Climb Power
- Computer Failure (ENG CMPTR light comes on during takeoff)

For the above conditions, refer to the *Aircraft Flight Manual, Subsection 4.05.*

INFLIGHT

Cruise with One Engine Inoperative

Performance data for single engine operation can be found in the *Crew Manual, Volume 2, Section 6.*

If an engine fails, thrust may be increased up to maximum continuous on the operating engine, to minimize the loss of speed and altitude.

The recommended long range cruise speed, given in *Crew Manual, Volume* 2, gives best range at a fixed altitude. However, it will be an advantage to frequently reduce the speed to the minimum cruising KIAS in order to reduce the loss of altitude. This minimum speed is the same as that given for all engine operation and should be used only until the aircraft can accelerate to the long range speed.

If obstacle clearance is most important, the enroute climb speed will give the minimum gradient of descent and the best ceiling, but it is too slow for long range operation. Therefore, the general procedure is to increase power to maximum continuous and maintain altitude while speed falls to the minimum cruising speed. The aircraft will then drift down to the single engine cruise ceiling. When a satisfactory cruise altitude is established, allow the speed to rise the long range KIAS or higher if range is not critical.

IN VISUAL FLIGHT CONDITIONS ONLY

1. IF OBSTACLE CLEARANCE IS NOT LIMITING, ACCELERATE AND RETRACT FLAPS AT CONVENIENT SAFE HEIGHT (400' AGL/ V_2 + 10 KT).

2. IF SPEED AT ENGINE FAILURE IS GREATER THAN V_2, MAINTAIN SPEED UNTIL ACCELERATION POINT.

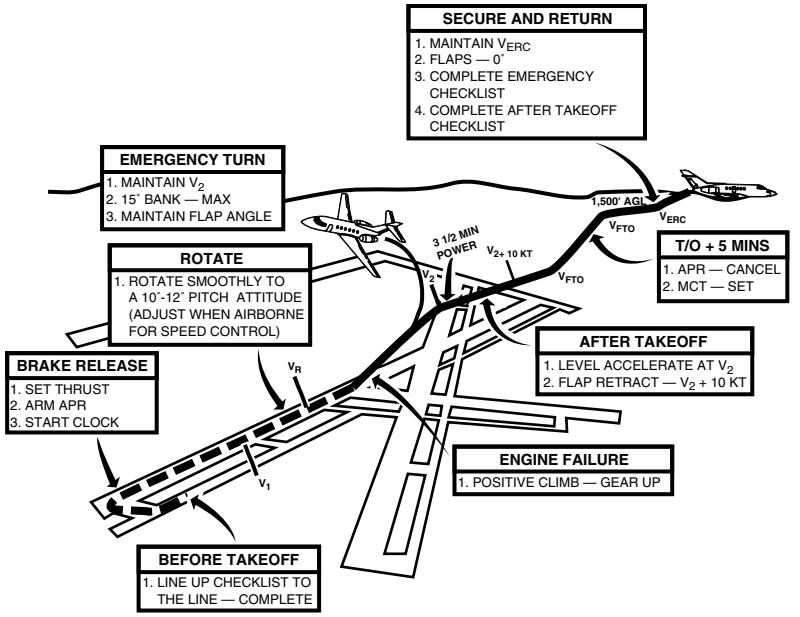


Figure MAP 7. Takeoff–Engine Failure After V_1 (Low Performance Profile)

Engine Relight

Refer to the *Aircraft Flight Manual, Subsection 4.05, Abnormal Procedures*.

Crew Training (Maximum Permissible Speed)

NOTE

The following procedures apply when the aircraft is solely for the purpose of pilot training or routine test flights with no passengers on board.

IN VISUAL FLIGHT CONDITIONS ONLY

1. IF OBSTACLE CLEARANCE IS NOT LIMITING, ACCELERATE AND RETRACT FLAPS AT CONVENIENT SAFE HEIGHT (400' AGL/ V_2 + 10 KT).

2. IF SPEED AT ENGINE FAILURE IS GREATER THAN V_2, MAINTAIN SPEED UNTIL ACCELERATION POINT.

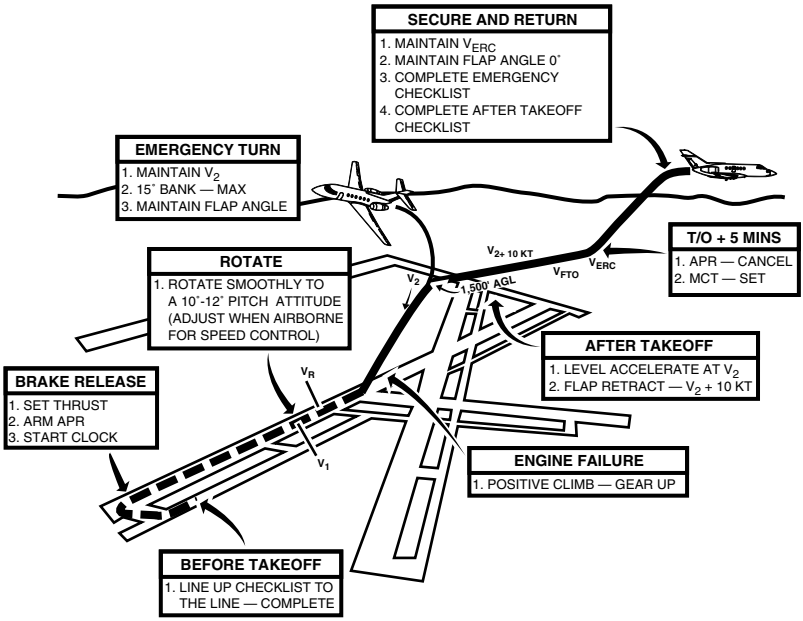


Figure MAP 8. Takeoff–Engine Failure After V_1 (High Performance Profile)

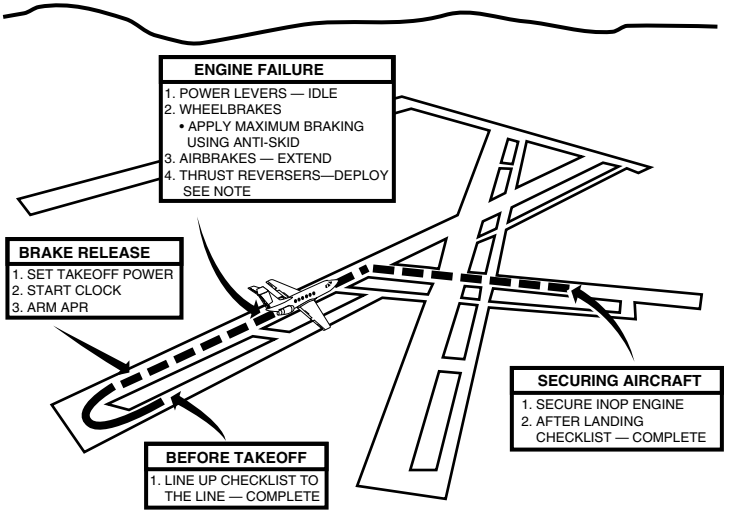

ENGINE FAILURE
1. POWER LEVERS — IDLE
2. WHEELBRAKES
• APPLY MAXIMUM BRAKING USING ANTI-SKID
3. AIRBRAKES — EXTEND
4. THRUST REVERSERS—DEPLOY SEE NOTE
BRAKE RELEASE
1. SET TAKEOFF POWER
2. START CLOCK
3. ARM APR
SECURING AIRCRAFT
1. SECURE INOP ENGINE
2. AFTER LANDING CHECKLIST — COMPLETE
BEFORE TAKEOFF
1. LINE UP CHECKLIST TO THE LINE — COMPLETE
NOTE: ON SLIPPERY RUNWAY, EXTEND AIRBRAKES, SELECT 45˚ FLAPS AND DEPLOY LIFT DUMP.

Figure MAP 9. Takeoff–Rejected Takeoff

For the purpose of allowing pilots experience the characteristics of flight at mach numbers greater than those permitted for normal operations, the speed may be increased to a maximum indicated mach number of 0.82.

For this demonstration the mach number should be increased by advancing the thrust levers fully and pushing the nose gently. To recover from the maneuver, the thrust levers should be reduced fully, the airbrakes opened, and a gentle pull-up commenced. Throughout this demonstration, the aircraft must be at an altitude greater than 30,000 feet with wings level and no applied g. This demonstration must not be attempted in turbulent conditions.

NOTE

In the event of inadvertently achieving a speed in excess of 0.82 M, recovery action must be taken immediately.

LANDING

Refer to Figure MAP-9, for a flight profile of a nonprecision approach (single engine).

- Approach and Landing (One Engine Inoperative)
- Go-Around (One Engine Inoperative)
- Emergency Overweight Landing
- Landing Above WAT Limit with One or Both Engines Operating
- Procedure with Engine Fuel Computer Inoperative
- Flapless Landing
- Landing with Asymmetric Air Brake
- Landing By Use of Trim System
- Height Losses Following Critical Maneuvers

For the above conditions, refer to the *Aircraft Flight Manual, Subsection 4.05.*

Landing Using Emergency Braking

If a main braking system failure is suspected but not confirmed before landing, the emergency system should not be selected prior to touchdown.

The normal brake system should be used and the emergency system only selected if complete failure of the normal system is confirmed after touchdown.

NOTE

If committed to using the emergency system, it should be selected with the pedals released.

With emergency selected, maxarets are not available so only minimum pedal pressure should be applied and maintained until the aircraft slows to taxiing speed. The pedals should not be pumped because rapid exhaustion of the emergency accumulator would occur.

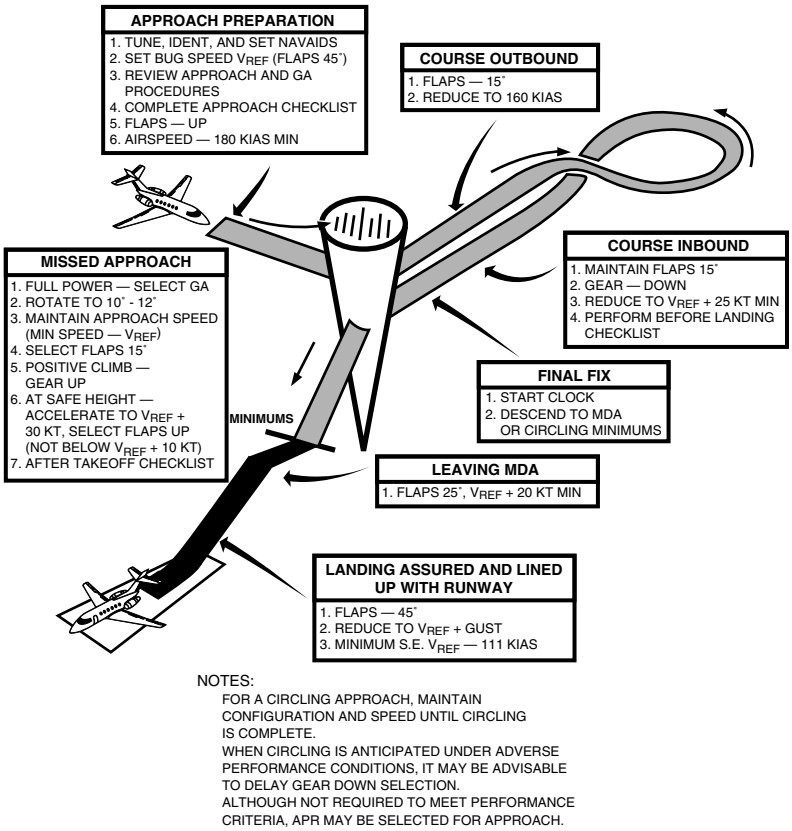
Landing After Gear Fails to Fully Lock Down

Refer to the *Aircraft Flight Manual, Section 3, Emergency Procedures.*

After Emergency Landing

The first officer or cabin attendant should open the main entry door or emergency escape hatch, as appropriate, and assist the passengers in leaving the aircraft.

The captain should make sure the emergency services have been alerted and shut down the aircraft before leaving.


APPROACH PREPARATION
1. TUNE, IDENT, AND SET NAVAIDS
2. SET BUG SPEED VREF (FLAPS 45˚)
3. REVIEW APPROACH AND GA PROCEDURES
4. COMPLETE APPROACH CHECKLIST
5. FLAPS — UP
6. AIRSPEED — 180 KIAS MIN
COURSE OUTBOUND
1. FLAPS — 15˚
2. REDUCE TO 160 KIAS
COURSE INBOUND
1. MAINTAIN FLAPS 15˚
2. GEAR — DOWN
3. REDUCE TO VREF + 25 KT MIN
4. PERFORM BEFORE LANDING CHECKLIST
MISSED APPROACH
1. FULL POWER — SELECT GA
2. ROTATE TO 10˚ - 12˚
3. MAINTAIN APPROACH SPEED (MIN SPEED — VREF)
4. SELECT FLAPS 15˚
5. POSITIVE CLIMB — GEAR UP
6. AT SAFE HEIGHT — ACCELERATE TO VREF + 30 KT, SELECT FLAPS UP (NOT BELOW VREF + 10 KT)
7. AFTER TAKEOFF CHECKLIST
FINAL FIX
1. START CLOCK
2. DESCEND TO MDA OR CIRCLING MINIMUMS
MINIMUMS
LEAVING MDA
1. FLAPS 25˚, VREF + 20 KT MIN
LANDING ASSURED AND LINED UP WITH RUNWAY
1. FLAPS — 45˚
2. REDUCE TO VREF + GUST
3. MINIMUM S.E. VREF — 111 KIAS

NOTES:

FOR A CIRCLING APPROACH, MAINTAIN CONFIGURATION AND SPEED UNTIL CIRCLING IS COMPLETE.

WHEN CIRCLING IS ANTICIPATED UNDER ADVERSE PERFORMANCE CONDITIONS, IT MAY BE ADVISABLE TO DELAY GEAR DOWN SELECTION.

ALTHOUGH NOT REQUIRED TO MEET PERFORMANCE CRITERIA, APR MAY BE SELECTED FOR APPROACH.

Figure MAP-10. Approach–Nonprecision (One Engine)

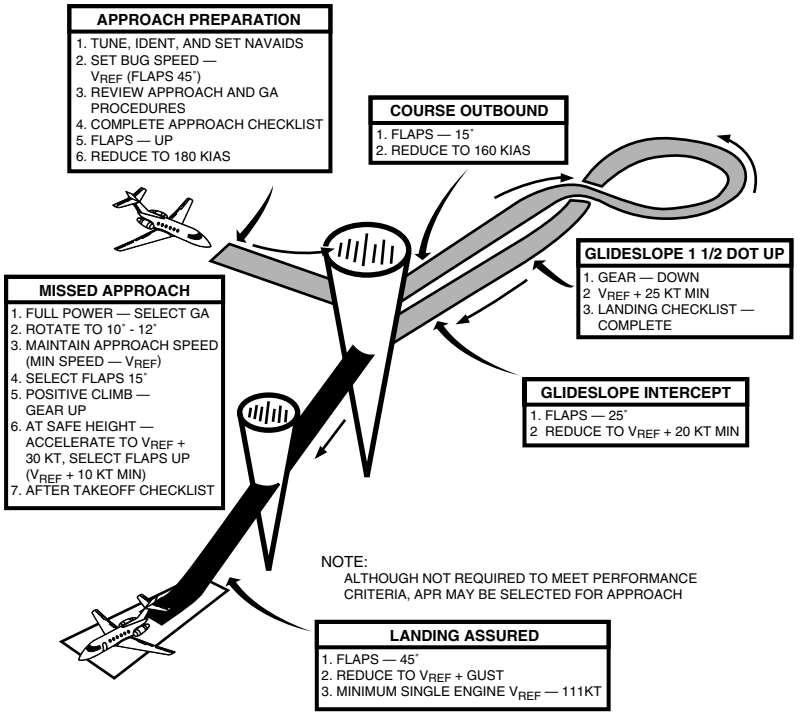

APPROACH PREPARATION
1. TUNE, IDENT, AND SET NAVAIDS
2. SET BUG SPEED — VREF (FLAPS 45˚)
3. REVIEW APPROACH AND GA PROCEDURES
4. COMPLETE APPROACH CHECKLIST
5. FLAPS — UP
6. REDUCE TO 180 KIAS
COURSE OUTBOUND
1. FLAPS — 15˚
2. REDUCE TO 160 KIAS
GLIDESLOPE 1 1/2 DOT UP
1. GEAR — DOWN
2 VREF + 25 KT MIN
3. LANDING CHECKLIST — COMPLETE
MISSED APPROACH
1. FULL POWER — SELECT GA
2. ROTATE TO 10˚ - 12˚
3. MAINTAIN APPROACH SPEED (MIN SPEED — VREF)
4. SELECT FLAPS 15˚
5. POSITIVE CLIMB — GEAR UP
6. AT SAFE HEIGHT — ACCELERATE TO VREF + 30 KT, SELECT FLAPS UP (VREF + 10 KT MIN)
7. AFTER TAKEOFF CHECKLIST
GLIDESLOPE INTERCEPT
1. FLAPS — 25˚
2 REDUCE TO VREF + 20 KT MIN
NOTE:
ALTHOUGH NOT REQUIRED TO MEET PERFORMANCE CRITERIA, APR MAY BE SELECTED FOR APPROACH
LANDING ASSURED
1. FLAPS — 45˚
2. REDUCE TO VREF + GUST
3. MINIMUM SINGLE ENGINE VREF — 111KT

Figure MAP-11. Approach–ILS (One Engine)

DITCHING

The Hawker 800 XP is not certified for ditching, however, the following recommended procedures are considered to result in the minimum of aircraft damage and the least injury to passengers.

They contain the best available advice, being based largely on model ditching tests on the British Royal Air Force Dominie and general ditching procedures of other aircraft (reference R & M No. 2917). These recommendations are not based on tests made with a Hawker 800 XP. No such tests have been carried out.

- ***State of Sea***—This is better assessed from a height of 500 to 1,000 ft, particularly the direction of swell which may not be as obvious as the less important wave direction when seen from a lower altitude.

  When there is no swell, alight into wind. In the presence of swell, and provided that drift does not exceed 10° alight parallel to the swell and as nearly into wind as possible. If drift exceeds 10°, alight into wind.

NOTE

Every effort should be made to minimize roll.

General

Transmit a warning of possible ditching as soon as the emergency arises and while height remains. The transmission can be cancelled later if danger is averted.

If possible, the ditching should take place while power is still available. This will enable the most favorable conditions to be selected.

Direction of Ditching

The direction of ditching is mainly dependent on wind and state of sea and these factors may be assessed as follows:

- ***Wind Direction***—This may be found by observing the waves, which move and break downwind, spray from the wave tops is also a reliable indicator.

- ***Wind Speed***—The following conditions can be used as a guide to wind speed:

  A few white crests ..... 8-17 Knots

  Many white crests ..... 17-26 Knots

  Streaks of foam along the water ..... 23-35 Knots

  Spray from the waves ..... 35-43 Knots

Action

Passenger Preparation

- Switch on the appropriate cabin signs and securely stow all personal baggage.
- Make certain that all life jackets are fitted and their use understood.
- Give instructions for eyeglasses and dentures to be removed, with collars and ties loosened.
- Check that the seat backs are upright and safety belts are fastened.
- Instruct passengers on correct posture for ditching.
- Advise the passengers to use the emergency overwing exit only and not to use the main entry door.

Depressurization

- Depressurize the cabin by 1,500 ft above sea level.
- Close MAIN AIR VALVES 1 and 2 and check that the dump valve is closed.

During Descent

- Switch on all external lights to aid location of the aircraft.
- At night, switch off all lights likely to impair night vision and switch on emergency lighting.
- Check all crew members are at ditching stations with lifejackets fitted and safety harnesses tight.

Approach and Touchdown

- Disengage the autopilot.
- Approach with landing gear up and flaps at 45°.
- Touchdown at the lowest practicable speed and rate of descent.
- Use landing lights unless mist causes reflected glare.

Under such conditions, when the sea may not be seen clearly before impact, control the rate of descent at approximately 200 ft per minute until the aircraft strikes the water. Otherwise hold off until excess speed is lost, aiming to strike the water in a tail down attitude at a speed slightly lower than normal touchdown speed.

After Ditching (Or Emergency Alighting on Water)

- First officer to remove the emergency overwing exit and leave the aircraft first.

WARNING

Do not open the main entrance door.

If the main entrance door is opened, on a surface other than flat calm conditions, water will enter the cabin.

- First officer to assist the passengers in leaving the aircraft.
- Captain is to make certain that all passengers are out of the aircraft and then leave the aircraft.
- After leaving the aircraft, the captain is to make certain all lifejackets are inflated correctly

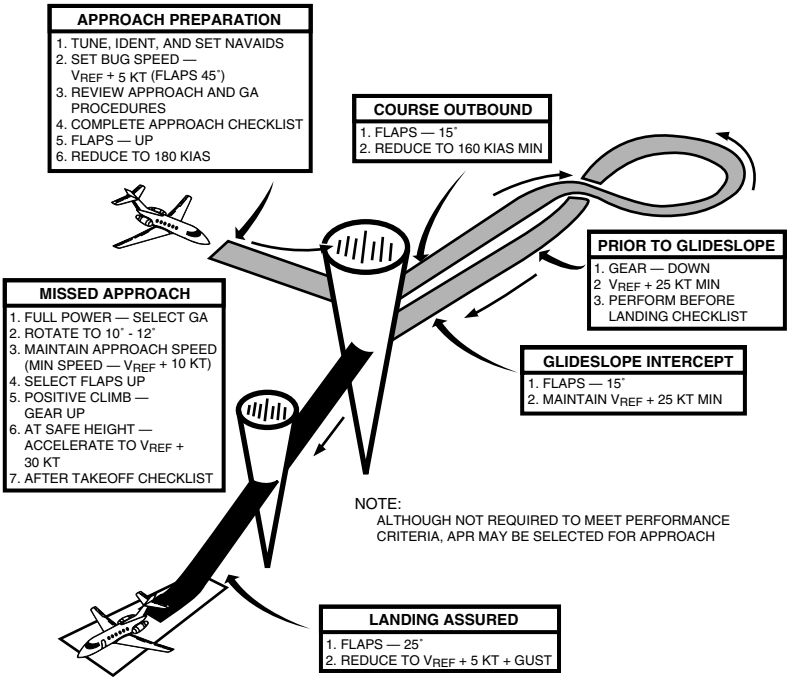

APPROACH PREPARATION
1. TUNE, IDENT, AND SET NAVAIDS
2. SET BUG SPEED — VREF + 5 KT (FLAPS 45˚)
3. REVIEW APPROACH AND GA PROCEDURES
4. COMPLETE APPROACH CHECKLIST
5. FLAPS — UP
6. REDUCE TO 180 KIAS
COURSE OUTBOUND
1. FLAPS — 15˚
2. REDUCE TO 160 KIAS MIN
PRIOR TO GLIDESLOPE
1. GEAR — DOWN
2 VREF + 25 KT MIN
3. PERFORM BEFORE LANDING CHECKLIST
MISSED APPROACH
1. FULL POWER — SELECT GA
2. ROTATE TO 10˚ - 12˚
3. MAINTAIN APPROACH SPEED (MIN SPEED — VREF + 10 KT)
4. SELECT FLAPS UP
5. POSITIVE CLIMB — GEAR UP
6. AT SAFE HEIGHT — ACCELERATE TO VREF + 30 KT
7. AFTER TAKEOFF CHECKLIST
GLIDESLOPE INTERCEPT
1. FLAPS — 15˚
2. MAINTAIN VREF + 25 KT MIN
NOTE:
ALTHOUGH NOT REQUIRED TO MEET PERFORMANCE CRITERIA, APR MAY BE SELECTED FOR APPROACH
LANDING ASSURED
1. FLAPS — 25˚
2. REDUCE TO VREF + 5 KT + GUST

Figure MAP-12. ILS Approach–Landing Above W.A.T. Limit

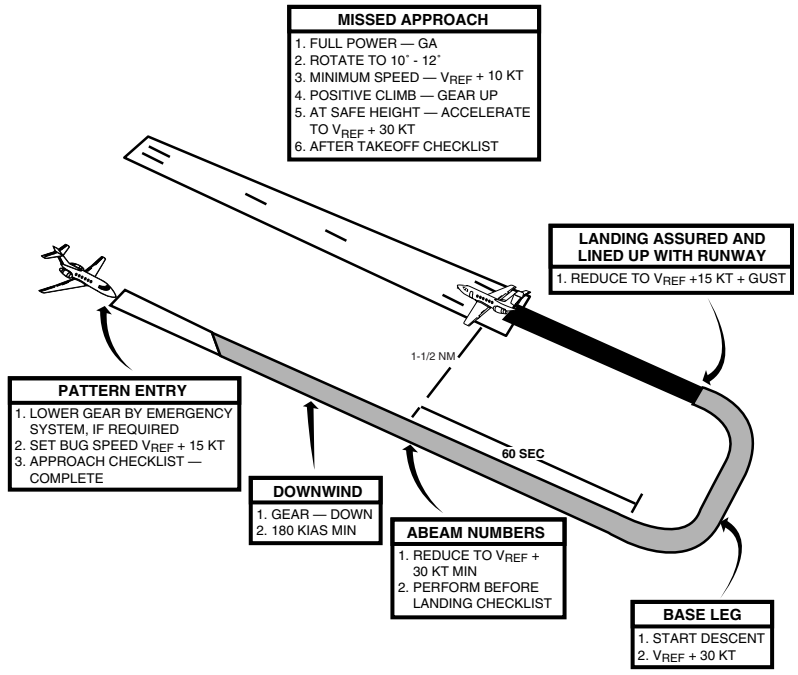

MISSED APPROACH
1. FULL POWER — GA
2. ROTATE TO 10˚ - 12˚
3. MINIMUM SPEED — VREF + 10 KT
4. POSITIVE CLIMB — GEAR UP
5. AT SAFE HEIGHT — ACCELERATE TO VREF + 30 KT
6. AFTER TAKEOFF CHECKLIST
LANDING ASSURED AND LINED UP WITH RUNWAY
1. REDUCE TO VREF +15 KT + GUST
1-1/2 NM
60 SEC
PATTERN ENTRY
1. LOWER GEAR BY EMERGENCY SYSTEM, IF REQUIRED
2. SET BUG SPEED VREF + 15 KT
3. APPROACH CHECKLIST — COMPLETE
DOWNWIND
1. GEAR — DOWN
2. 180 KIAS MIN
ABEAM NUMBERS
1. REDUCE TO VREF + 30 KT MIN
2. PERFORM BEFORE LANDING CHECKLIST
BASE LEG
1. START DESCENT
2. VREF + 30 KT

Figure MAP-13. Visual Approach–No Flap

STEEP TURNS

OBJECTIVE

Proficiency in controlling the aircraft with greater than normal bank attitudes

DESCRIPTION

Steep turns may be accomplished at any gross weight. Airspeed is normally stabilized at 220 knots, and a slow, smooth entry to a 45° bank is accomplished. Turns should exceed 180° but need not be greater than 360° in duration. Refer to Figure MAP-4.

NOTE

Practice at airspeeds other than 220 knots may be utilized at the discretion of the instructor.

ACCEPTABLE PERFORMANCE GUIDELINES

- Altitude ±100 feet
- Airspeed ± 10 knots
- Heading ±10°
- Bank angle ±5°

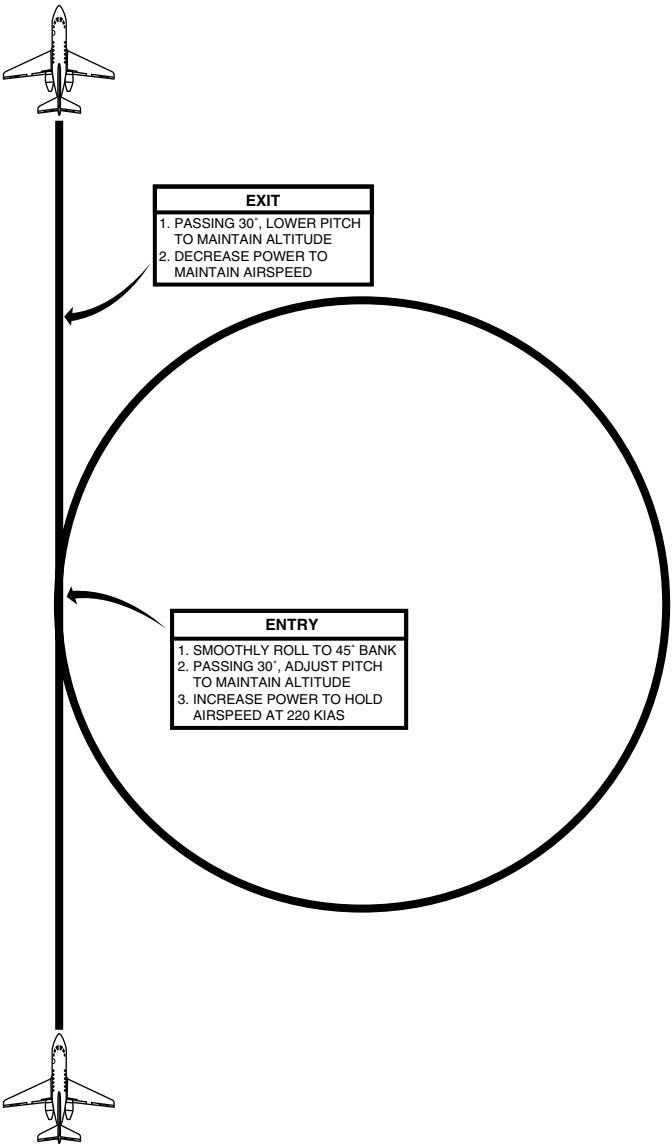

EXIT
1. PASSING 30˚, LOWER PITCH TO MAINTAIN ALTITUDE
2. DECREASE POWER TO MAINTAIN AIRSPEED
ENTRY
1. SMOOTHLY ROLL TO 45˚ BANK
2. PASSING 30˚, ADJUST PITCH TO MAINTAIN ALTITUDE
3. INCREASE POWER TO HOLD AIRSPEED AT 220 KIAS

Figure MAP-14. Steep Turns

APPROACHES TO STALL

OBJECTIVE

To familiarize the pilot with the aircraft handling characteristics in the initial stick shaker and stick pusher regime, and to provide training in stall recovery techniques.

DESCRIPTION

Approaches to stall (Figure MAP-14) may be practiced at a minimum altitude of 8,000 feet AGL with the aircraft in the clean configuration. Approaches to stalls will be practiced with the wing level and from turns. Some altitude loss may be experienced on the recovery; however, the loss should be kept to a minimum. When intentional approaches to stall are carried out, the following conditions shall apply:

- Altitude between 10,000 and 18,000 feet MSL
- Autopilot disengaged
- Ignition on
- Engine synchronizer off
- Stall identification system operative
- All external surfaces free from ice
- The ventral fuel tank empty
- Weather radar at standby
- Yaw damper on or off

NOTE

For training purposes the maneuver will not continue beyond the onset of stick shaker.

Clean (Flaps 0°) and Takeoff (Flaps 15°) Configuration

Determine the V_2 airspeed for weight and configuration. The maneuver is begun at V_2 +20 knots, flaps and bank as directed, and N_1 idle. Maintain a constant altitude while the airspeed bleeds off, and trim out any elevator pressure down to V_2 +20 knots. Below V_2 +20 knots maintain altitude with back pressure on the yoke.

At the onset of stick shaker, commence the recovery by advancing the power levers to full forward (maximum takeoff thrust) while simultaneously decreasing the pitch attitude approximately 2° (if applicable). As the airspeed

increases to V_2, smoothly rotate to 12 noseup if necessary to stop the rate of descent and regain any lost altitude. If in the takeoff configuration (flaps 15°), retract the flaps at V_2 + 20 knots. The maneuver is complete when the aircraft is at V_2 + 20 knots and at the initial altitude.

Approach (Gear down, Flaps 25°) and Landing (Gear Down, Flaps 45°) Configuration

Determine the V_{REF} airspeed for the weight and configuration. The maneuver is begun at V_{REF} + 20 knots, flaps and bank as directed, and power not to exceed 77% N_1 rpm. Maintain a constant altitude while airspeed bleeds off, and trim out any elevator pressure down to V_{REF} +20 knots. Below V_{REF} +20 knots, maintain altitude with back pressure on the yoke.

At the onset of stick shaker, commence the recovery by advancing the power levers to full forward (maximum takeoff thrust), while simultaneously retracting the flaps to 15°, decreasing the pitch attitude approximately 5°, and rolling the wings to level (if applicable). As the airspeed increases to V_{REF}, smoothly rotate to 12° noseup, if necessary, to stop the rate of descent and regain any lost altitude. Retract the landing gear when a positive rate of climb is indicated. Retract the flaps at V_{REF} +20 knots. The maneuver is complete when the aircraft is at V_{REF} +20 knots and at the initial altitude.

	SET UP				RECOVERY					
	Flaps	**Gear**	**Power**	**Power N_1**	**Pitch**	**Flaps Change**	**Speed**	**Pitch**	**Gear Up**	**Flaps —**
CLEAN	0°	Up	idle	Full	Approx 2°	—	V_2	12°	—	—
TAKEOFF	15°	Up	idle	Full	Approx 2°	—	V_2	12°—	—	V2 +20 Up
APPROACH	25°	Down	≤77%	Full	Approx 5°	15°	V_{REF}	12°	POS Rate Up	V_{REF}+20
LANDING	45°	Down	≤77%	Full	Approx 5°	15°	V_{REF}	12°	POS Rate Up	V_{REF}+20

The stick push will be considered the aircraft stall. Approaches to the stick pusher for 0° and 15° stalls may be demonstrated. The aircraft will not be taken to the aerodynamic stall. There is no natural stall warning or aerodynamic buffet prior to the stick pusher. Stall warning is provided by a stick shaker which is set to operate at an indicated airspeed of 7 to 9% above the aircraft stalling speed. Some aerodynamic buffet may occur briefly at the point of stall. The stall is identified by a short forward movement of the control column, provided by the stall identification system. The red STALL VALV OPEN

annunciator to the left of each main attitude display will illuminate. When stalls are demonstrated to the pusher, the aircraft should be allowed to pitch nosedown until stick push has been canceled automatically, and should then be recovered to normal controlled flight. Any tendency to roll should be corrected by the use of ailerons. Do not attempt to hold the aircraft in the stall.

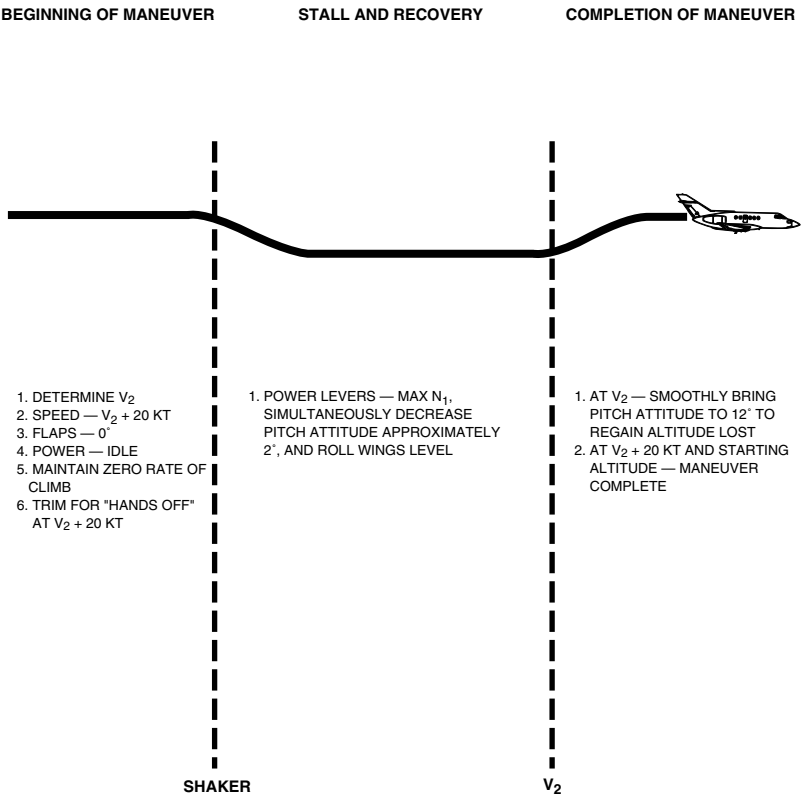

BEGINNING OF MANEUVER
STALL AND RECOVERY
COMPLETION OF MANEUVER
1. DETERMINE V_2
2. SPEED — V_2 + 20 KT
3. FLAPS — 0°
4. POWER — IDLE
5. MAINTAIN ZERO RATE OF CLIMB
6. TRIM FOR "HANDS OFF" AT V_2 + 20 KT
1. POWER LEVERS — MAX N_1, SIMULTANEOUSLY DECREASE PITCH ATTITUDE APPROXIMATELY 2°, AND ROLL WINGS LEVEL
1. AT V_2 — SMOOTHLY BRING PITCH ATTITUDE TO 12° TO REGAIN ALTITUDE LOST
2. AT V_2 + 20 KT AND STARTING ALTITUDE — MANEUVER COMPLETE
SHAKER
V_2
CLEAN CONFIGURATION

Figure Map-15. Approach To Stall (Sheet 1 of 3)

ACCEPTABLE PERFORMANCE GUIDELINES

- Maintain positive control of the aircraft.
- Heading ±5° except in turning approaches to stall.
- Recovery will be sufficiently smooth to avoid a secondary indication of an approach to a stall (stick shaker).

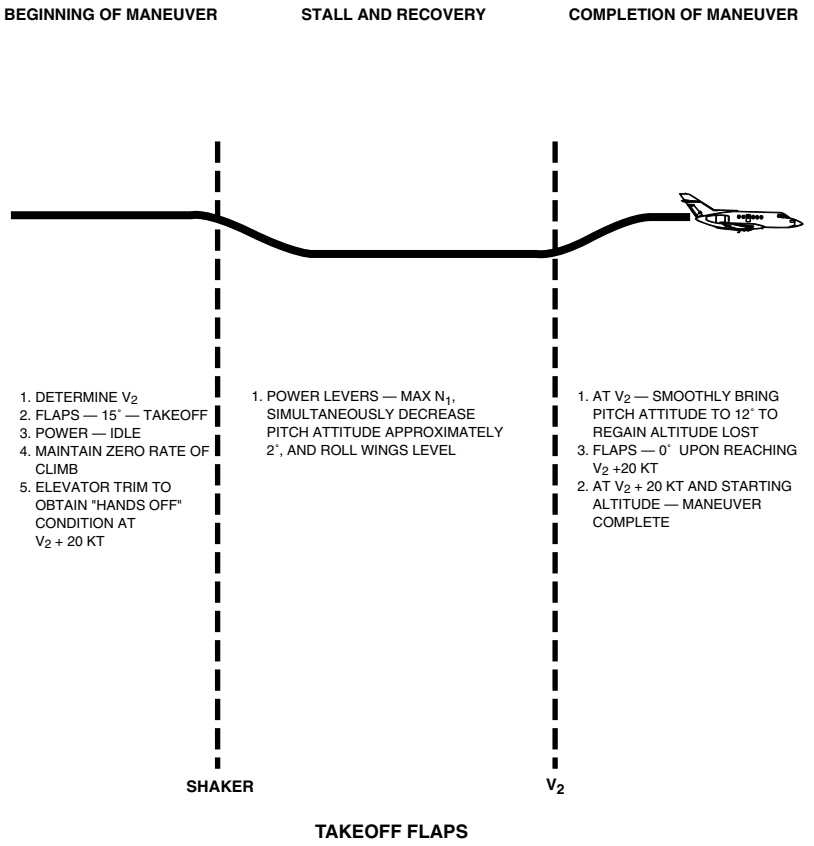

BEGINNING OF MANEUVER
STALL AND RECOVERY
COMPLETION OF MANEUVER
1. DETERMINE V_2
2. FLAPS — 15° — TAKEOFF
3. POWER — IDLE
4. MAINTAIN ZERO RATE OF CLIMB
5. ELEVATOR TRIM TO OBTAIN "HANDS OFF" CONDITION AT V_2 + 20 KT
1. POWER LEVERS — MAX N_1, SIMULTANEOUSLY DECREASE PITCH ATTITUDE APPROXIMATELY 2°, AND ROLL WINGS LEVEL
1. AT V_2 — SMOOTHLY BRING PITCH ATTITUDE TO 12° TO REGAIN ALTITUDE LOST
3. FLAPS — 0° UPON REACHING V_2 +20 KT
2. AT V_2 + 20 KT AND STARTING ALTITUDE — MANEUVER COMPLETE
SHAKER
V_2
TAKEOFF FLAPS

Figure Map-15. Approach To Stall (Sheet 2 of 3)

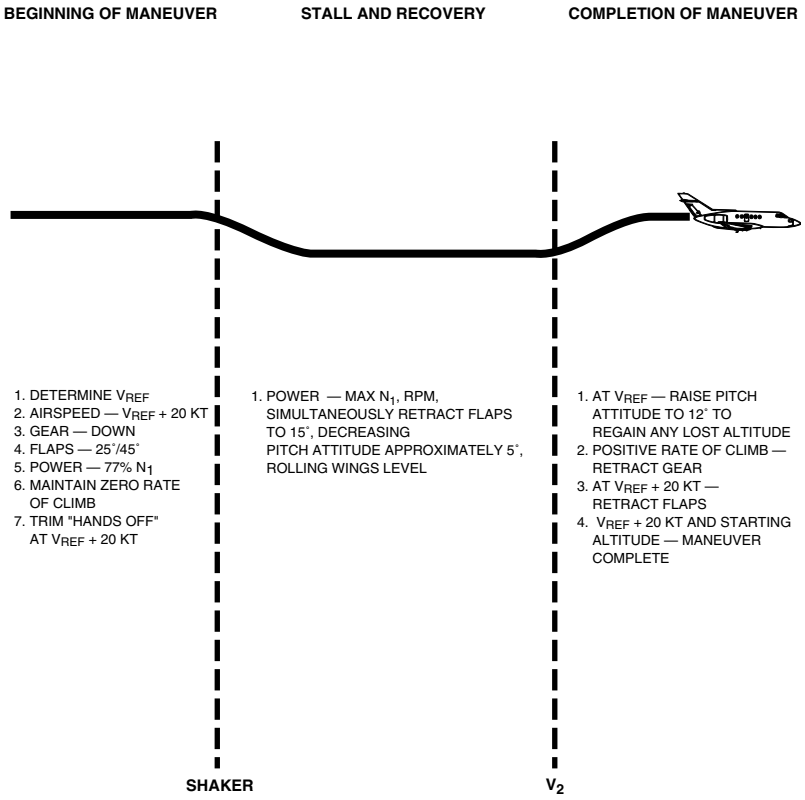

BEGINNING OF MANEUVER
STALL AND RECOVERY
COMPLETION OF MANEUVER
1. DETERMINE V_{REF}
2. AIRSPEED — V_{REF} + 20 KT
3. GEAR — DOWN
4. FLAPS — 25˚/45˚
5. POWER — 77% N_1
6. MAINTAIN ZERO RATE OF CLIMB
7. TRIM "HANDS OFF" AT V_{REF} + 20 KT
1. POWER — MAX N_1, RPM, SIMULTANEOUSLY RETRACT FLAPS TO 15˚, DECREASING PITCH ATTITUDE APPROXIMATELY 5˚, ROLLING WINGS LEVEL
1. AT V_{REF} — RAISE PITCH ATTITUDE TO 12˚ TO REGAIN ANY LOST ALTITUDE
2. POSITIVE RATE OF CLIMB — RETRACT GEAR
3. AT V_{REF} + 20 KT — RETRACT FLAPS
4. V_{REF} + 20 KT AND STARTING ALTITUDE — MANEUVER COMPLETE
SHAKER
V_2
LANDING CONFIGURATION

Figure Map-15. Approach To Stall (Sheet 3 of 3)

MANEUVERING AT MINIMUM AIRSPEEDS

OBJECTIVE

To demonstrate the degree of controllability available while in close proximity to the prestall warning. It provides practice in control techniques useful in the low-airspeed regimes encountered during takeoffs, landings, and engine-out emergency situations. This is not a required certification manuever.

DESCRIPTION

Emphasis is placed upon coordinated flight control use, as well as prompt corrective action in response to airspeed or attitude deviations.

CONFIGURATION	AIRSPEED
Flaps 0°	175 knots
Flaps 15°	165 knots
Landing gear down	155 knots
Flaps 25°	145 knots
Flaps 45°	135 knots

Banks of 15° while alternately turning to a point 30° either side of a specified heading and changing configuration during each reversal will develop control touch, feel, and coordination.

ACCEPTABLE PERFORMANCE GUIDELINES

- Maintain positive aircraft control.
- Altitude ±100 feet
- Heading ±10° when appropriate

TRIM AND PITCH CHANGE CHARACTERISTICS

OBJECTIVE

To enable the pilot to properly anticipate trim changes required by the pitch effects of thrust, landing gear, flaps, and airbrakes, and the effect of trim rates. This is not a required certification manuever.

DESCRIPTION

The aircraft is trimmed hands off straight and level at 160 knots. The effects of increased or decreased thrust, extension and retraction of the landing gear, and extending and retracting the airbrakes are demonstrated so that pitch effects may be observed. These same maneuvers are accomplished with the pilot maintaining a constant altitude so that appropriate "feel" may be experienced.

The following should be noted:

Rapid increase in power ..... Nosedown

Extension of landing gear ..... No change

Extension of flaps ..... Nosedown

Airbrake extension ..... No change
(Observe placard limits)

Elevator trim rates with 25° and 45° are greater than with flaps 0° and 15°.

ACCEPTABLE PERFORMANCE GUIDELINES

No specific degree of proficiency is required other than the pilot's obtaining a basic understanding and knowledge of the aircraft's trim change characteristic.

UNUSUAL ATTITUDES

OBJECTIVE

Proficiency in the proper recovery techniques while flying on instruments

DESCRIPTION

Unusual attitudes may be caused by inattention, wake turbulence, AHRS failure, or PFD failure. Unusual attitudes may be grouped into two broad categories—noseup and nosedown—with an infinite variety within these categories depending upon the severity of the pitch and roll digressions. The recovery procedures are designed to bring the aircraft under control without flaming out any engines, damaging the aircraft, or injuring passengers.

Training should include a nose-high turn approaching stall with the power reduced and a ~nosedown diving spiral with the airspeed increasing and the power advanced. These two unusual positions test the pilot's basic analysis and recovery techniques. Training in extreme unusual altitudes is accomplished.

RECOVERY PROCEDURES

Nose High

In a nose-high condition with airspeed decreasing below normal, immediately add power to decrease the possibility of a stall, and check a second attitude source to confirm the validity of the aircraft attitude. At the same time roll the aircraft 30–60° (or greater as necessary), and allow the nose to fall toward the horizon. If already in a turn, increase the bank angle as necessary. Angle of bank is used to reduce the pitch attitude and decrease the possibility of flameout due to negative G loading. Do notpush the control yoke forward by itself to decrease the pitch attitude. When the nose approaches the horizon, roll toward wings level, check airspeed, and level off.

Nose Low

If a nosedown spiral is encountered with airspeed increasing above normal, immediately reduce thrust to flight idle and extend the airbrakes. This reduces any further airspeed increase and allows a more gradual pitch change without subjecting the aircraft to unnecessary positive G loading. Check a second attitude source to confirm the validity of the aircraft attitude. If the aircraft is in a banked attitude, roll the wings level prior to raising the nose. Attempting to pull out of the dive while in a bank tightens the spiral and could cause a high-speed stall or structural damage. The aircraft can sustain more G loading in a wings-level pullout than in a rolling pullout.

Emphasis is placed on the need for continual cross-check of the flight instruments and the avoidance of unusual attitudes, thus eliminating the potential hazards of this maneuver.

ACCEPTABLE PERFORMANCE GUIDELINES

- Maintain positive control of the aircraft.
- Recovery will be sufficiently smooth with no excessive positive or negative G loads.
- Original altitude, heading, and airspeed will be quickly and safely regained.

HOLDING

OBJECTIVE

Proficiency in applying the required instrument holding pattern procedures.

WEIGHT AND BALANCE

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Limiting Design Weights WB-1
Center-of-Gravity Limitations WB-1
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WEIGHT AND BALANCE

GENERAL

AIRCRAFT DESIGNATION

The following data apply to the B.Ae. 125-800.

LIMITING DESIGN WEIGHTS

Maximum ramp weight..... 28,120 lb

Maximum takeoff weight..... 28,000 lb

Maximum landing weight (Except in emergency) ..... 23,350 lb

Maximum zero fuel wieght..... 18,450 lb

The maximum wieght to which the aircraft is designed for jacking at the tail and fuselage jacking points is 25,255 lb.

Before jacking it is essential to check that the fuel load in one wing is the same as in the other.

CENTER-OF-GRAVITY LIMITATIONS

The center-of-gravity datum is at station 353.04 inches. This is 11 feet forward of the reference point, which is situated eternally on the fuselage immediately forward and positive aft.

The center-of-gravity limits are shown on the envelope.

Standard Mean Chord

In order to express the aircraft center-of-gravity as a decimal fraction of the wing standard mean chord, the following equation is used:

$$\text{Center-of-gravity, \% S.M.C.} = \frac{\bar{x} + 1.308}{7.263}$$

where $\bar{x}$ is the distance in feet that the center-of-gravity is forward (–) or aft (+) of the dataum: 1.308 feet is the distance that the leading edge of the standard mean chord is forward of the center-of-gravity datum; 7.263 feet is the length of the standard mean chord.

Thus, the center-of-gravity datum ($\bar{x}$=0) is located at:

$$\frac{0 + 1.308}{7.263} = 18\% \text{ S.M.C}$$

DETERMINATION OF WEIGHT AND CENTER-OF GRAVITY

The aircraft was weighed by The Raytheon Aircraft Co. using a Revere Aerospace Aircraft Weighing Kit S/N 6540C, M/NJW-75 calibrated August 1996.

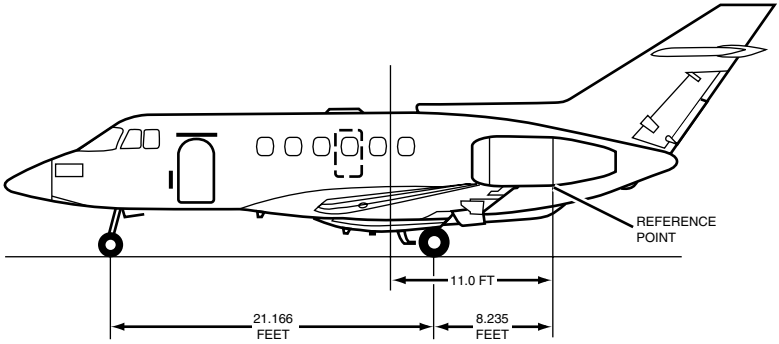


Figure WB-1. Aircraft dimensions

Table WB-1. SCALE WEIGHT

Item	Weight	Arm	Moment
Left Jack Point	5,856.00	–4.12	–24,126.72
Right Jack Point	5,856.00	–4.12	–24,126.72
Tail Jack Point	4,030.00	15.65	63,069.50
Total	15,742.00	0.94	14,816.06

Center-of-Gravity (% S.M.C.) = 30.97



Table WB-2. CORRECTED EMPTY WEIGHT

Item	Weight	Arm	Moment
Scale Weight	15,742.00	0.94	14,816.06
Minus Undrainable Fuel (3.3 U.S. gals)	–22.00	–1.30	28.60
Minus Oxygen (1,500 liters)	–4.82	15.10	–72.78
Minus Oxygen (1,000 liters)	–3.21	12.54	–40.25
Minus TKS Fluid (10 gal)	–84.00	–15.70	1,318.80
Add Headbumper	14.00	–13.80	–193.20
Total	15,641.97	1.01	15,857.22

Center-of-Gravity (% S.M.C.) = 31.97

Table WB-3. BASIC EMPTY WEIGHT

Item	Weight	Arm	Moment
Corrected Empty Weight	15,641.97	1.01	15,857.22
Unusable Fuel (12.1 U.S. gal)	81.00	–0.75	–60.75
Total	15,722.97	1.00	15,796.47

Center-of-Gravity (% S.M.C.) = 31.84

Table WB-4. BASIC OPERATING WEIGHT

Item	Weight	Arm	Moment
Basic Empty Weight	15,722.97	1.00	15,796.47
Crew	340.00	–17.05	–5,797.00
Aircraft Manuals Allowance	18.00	–15.59	–280.62
Navigation Manuals Allowance	17.00	–14.75	–250.75
TKS Fluid (10.0 gal)	84.00	–15.70	–1,318.80
Oxygen (1,500 liters)	4.82	15.10	72.78
Oxygen (1,000 liters)	3.21	12.54	40.25
Galley Supply (110 lbs max)*	110.00	–10.60	–1,166.00
Galley Water Service (2.4 gal)	19.60	–11.40	–223.44
Toliet Service (1.5 gals precharged)	–12.50	4.56	57.00
Lav. Water Service (2.3 gal)	19.16	5.80	111.13
Total	16,351.26	0.43	7,041.03

Center-of-Gravity (% S.M.C.) = 23.94

NOTE:

* The decanters (full) are included in this weight. This is the maximum galley supplies allowed. The actual galley supplies' weights must be used in practice.

Maximum Occupancy with Baggage (30 lb/person) and Allowable Fuel

Table WB-5. ZERO FUEL WEIGHT

Item	Weight	Arm	Moment
Basic Operating Weight	16,351.26	0.43	7,041.03
Forward Baggage (max 250 lb)	240.00	–11.60	–2,784.00
Jump Seat Observer	0.00	–14.00	0.00
Seat 1 L/H Passenger	170.00	–8.00	–1,360.00
Seat 1 R/H Passenger	170.00	–8.00	–1,360.00
Seat 2 L/H Passenger	170.00	–3.80	–646.00
Seat 2 R/H Passenger*	170.00	–4.10	–697.00
Seat 3 L/H Passenger	170.00	0.30	51.00
Forward Divan Passenger	170.00	–1.16	–197.20
Middle Divan Passenger	170.00	0.50	85.00
Aft Divan Passenger	170.00	2.20	374.00
Aft Coat Closet (105 lb max)	60.00	2.50	150.00
Aft RH Baggage (No Storage)	0.00	4.60	0.00
Total	18,011.26	0.04	656.83

Center-of-Gravity (% S.M.C.) = 18.51

NOTE:
The above zero fuel weight loading represents maximum occupancy with baggage.
The baggage allowable is 30 lb per passenger. The 60 lb of additional baggage is crew baggage.
The maximum zero fuel weight for the Hawker 800 XP aircraft with modification 253169A is 18,450 lb.
There are various loadings of zero fuel weight and the arm and weight should be checked against the CG envelope in the *Hawker 800 XP Weight and Balance Manual* for validity.
*The seat 2 R/H passenger location is for takeoff and landing.

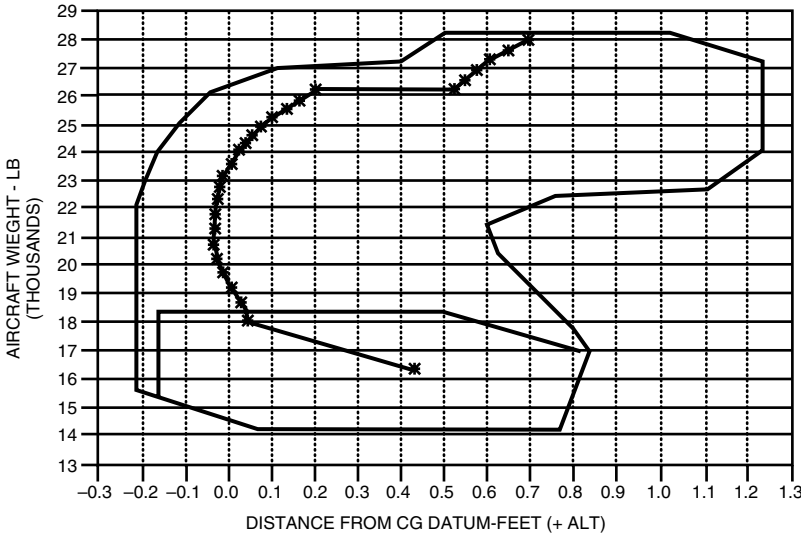
Table WB-6. MAXIMUM RAMP WEIGHT WITH MAXIMUM OCCUPANCY AND BAGGAGE

Item	Weight	Arm	Moment
Zero Fuel Weight	18,011.26	0.04	656.83
Wing Tanks (8,416 lb max)	8,416.00	0.69	5,780.00
Full Ventral Tank (224.5 U.S. gal)	1,496.00	8.36	12,514.00
Total	27,923.26	0.68	18,950.83

Center-of-Gravity (% S.M.C.) = 27.35

NOTE:
The above zero fuel weight is referenced from the above zero fuel weight loading.
The ventral fuel transfer occurs at a total wing tank fuel weight of 6,600 lb.
(ref. *Aircraft Flight Manual, Section 2*, page 6.
The maximum ramp weight of the Hawker 800 XP aircraft is 28,120 lb. The aircraft weight and arm must be always checked agains the CG envelope in the *Hawker 800 XP Weight and Balance Manual* for validity.

HAWKER 800 XP CENTER-OF-GRAVITY CHART



LEGEND

MAX OCCUPANCY

NOTE:
The above CG graph is referenced from the *Weight and Balance Manual*, *Section 1.0*, page 5.
This is the CG graph for Hawker 800 XP Aircraft with modification 253169A incorporated.

Figure WB-3. Maximum Occupancy and Baggage With Allowable Fuel (Eight Passenger Configuration)

Maximum Fuel with Allowable Passengers and Baggage (30 lb/person) Not to Exceed Maximum Ramp Weight

Table WB-7. ZERO FUEL WEIGHT

Item	Weight	Arm	Moment
Basic Operating Weight	16,351.26	0.43	7,041.03
Forward Baggage (max 250 lb)	240.00	–11.60	–2,784.00
Jump Seat Observer	0.00	–14.00	0.00
Seat 1 L/H Passenger	170.00	–8.00	–1,360.00
Seat 1 R/H Passenger	170.00	–8.00	–1,360.00
Seat 2 L/H Passenger	170.00	–3.80	–646.00
Seat 2 R/H Passenger*	170.00	–4.10	–697.00
Seat 3 L/H Passenger	170.00	0.30	51.00
Forward Divan Passenger	170.00	–1.16	–197.20
Middle Divan Passenger	170.00	0.50	85.00
Aft Divan Passenger	170.00	2.20	374.00
Aft Coat Closet (105 lb max)	60.00	2.50	150.00
Aft RH Baggage (No Storage)	0.00	4.60	0.00
Total	**18,011.26**	0.04	656.83

Center-of-Gravity (% S.M.C.) = 18.51

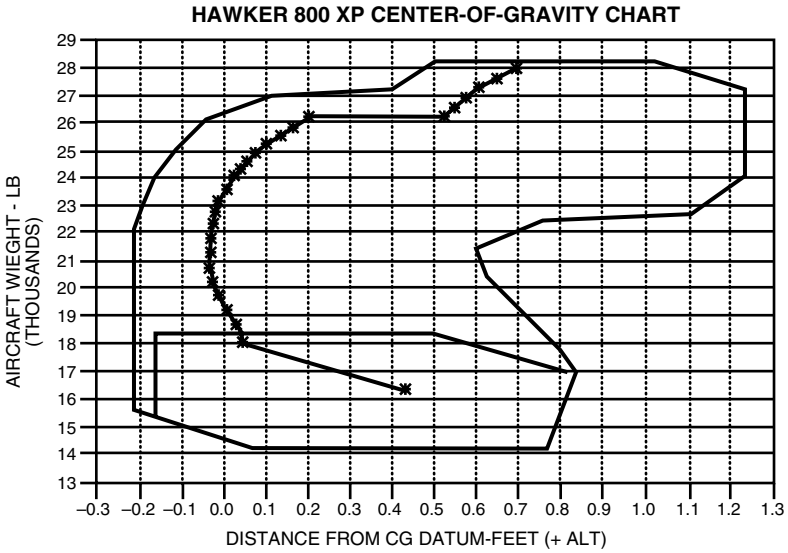
NOTE:
The above zero fuel weight loading represents the occupancy with baggage for a maximum fuel loading configuration.
The baggage allowable is 30 lb per passenger. The 60 lb of additional baggage is crew baggage.
The maximum zero fuel weight for the Hawker 800 XP aircraft with modification 253169A is 18,450 lb.
There are various loadings of zero fuel weight and the arm and weight should be checked against the CG envelope in the Hawker 800 XP Weight and Balance Manual for validity.
*The seat 2 R/H passenger location is for takeoff and landing.

Table WB-8. MAXIMUM RAMP WEIGHT WITH MAXIMUM OCCUPANCY AND BAGGAGE

Item	Weight	Arm	Moment
Zero Fuel Weight	18,011.26	0.04	656.83
Wing Tanks (8,416 lbs max)	8,416.00	0.69	5,780.00
Full Ventral Tank (224.5 U.S. gal)	1,496.00	8.36	12,514.00
Total	27,923.26	0.68	18,950.83

Center-of-Gravity (% S.M.C.) = 27.35

NOTE:
The above zero fuel weight is referenced from the above zero fuel weight loading.
The ventral fuel transfer occurs at a total wing tank fuel weight of 6,600 lbs.
(ref. *Aircraft Flight Manual, Section 2*, page 6.
The maximum ramp weight of the Hawker 800 XP aircraft is 28,120 lbs. The aircraft weight and arm must be always checked agains the CG envelope in the *Hawker 800 XP Weight and Balance Manual* for validity.



NOTE:
The above CG graph is referenced from the *Weight and Balance Manual*, *Section 1.0*, page 5.
This is the CG graph for Hawker 800 XP Aircraft with modification 253169A incorporated.

Figure WB-3. Maximum Fuel With Allowable Passengers and Baggage (Eight Passenger Configuration)

Table WB-9. MOST FORWARD LOADING

Item	Weight	Arm	Moment
Basic Operating Weight	16,351.26	0.43	7,041.03
Forward Baggage (max 250 lb)	240.00	–11.60	–2,900.00
Jump Seat Observer	0.00	–14.00	0.00
Seat 1 L/H Passenger	170.00	–8.00	–1,360.00
Seat 1 R/H Passenger	170.00	–8.00	–1,360.00
Seat 2 L/H Passenger	170.00	–3.80	–646.00
Seat 2 R/H Passenger*	170.00	–4.10	–697.00
Forward Divan Passenger	170.00	–1.16	–197.20
Zero Fuel Weight	17,451.26	–0.01	–119.17
Partial Wing Tanks (495.4 U.S. gal)	3,300.00	–0.47	–1,540.00
Most Fwd	20,751.26	–0.08	–1,659.17
See graph on page WB-11 for total curve with fuel in wing and ventral tanks.			

Center-of-Gravity (% S.M.C.) = 16.91

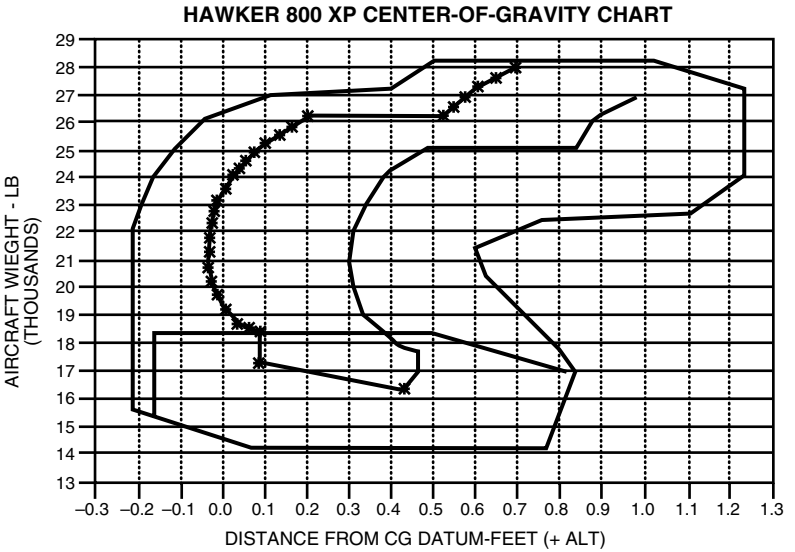
NOTE:
- The seat 2 R/H passenger location is for takeoff and landing.

Table WB-10. MOST AFT LOADING

Item	Weight	Arm	Moment
Basic Operating Weight	16,351.26	0.43	7,041.03
Seat 3 L/H Passenger	170.00	0.30	51.00
Middle Divan Passenger	170.00	0.50	85.00
Aft Divan Passenger	170.00	2.20	374.00
Aft Coat Closet (105 lb max)	105.00	2.50	262.50
Aft RH Baggage (No Storage)	0.00	4.60	0.00
Zero Fuel Weight	16,966.26	0.46	7,813.53
Full Wing Tanks (1,263.0 U.S. gal)	8,416.00	0.69	5,780.00
Full Ventral Tanks (224.5 U.S. gal)	1,496.00	8.36	12,514.00
Most Aft	26,878.26	0.97	26,107.53
See graph on page WB-11 for total curve with fuel in wing and ventral tanks.			

Center-of-Gravity (% S.M.C.) = 31.38





LEGEND

- MAX OCCUPANCY
- MOST AFT

NOTE:

The above CG graph is referenced from the *Weight and Balance Manual*, *Section 1.0*, page 5. This is the CG graph for Hawker 800 XP Aircraft with modification 253169A incorporated.

Figure WB-4. Most Forward and Aft Loadings (Eight Passenger Configuration)

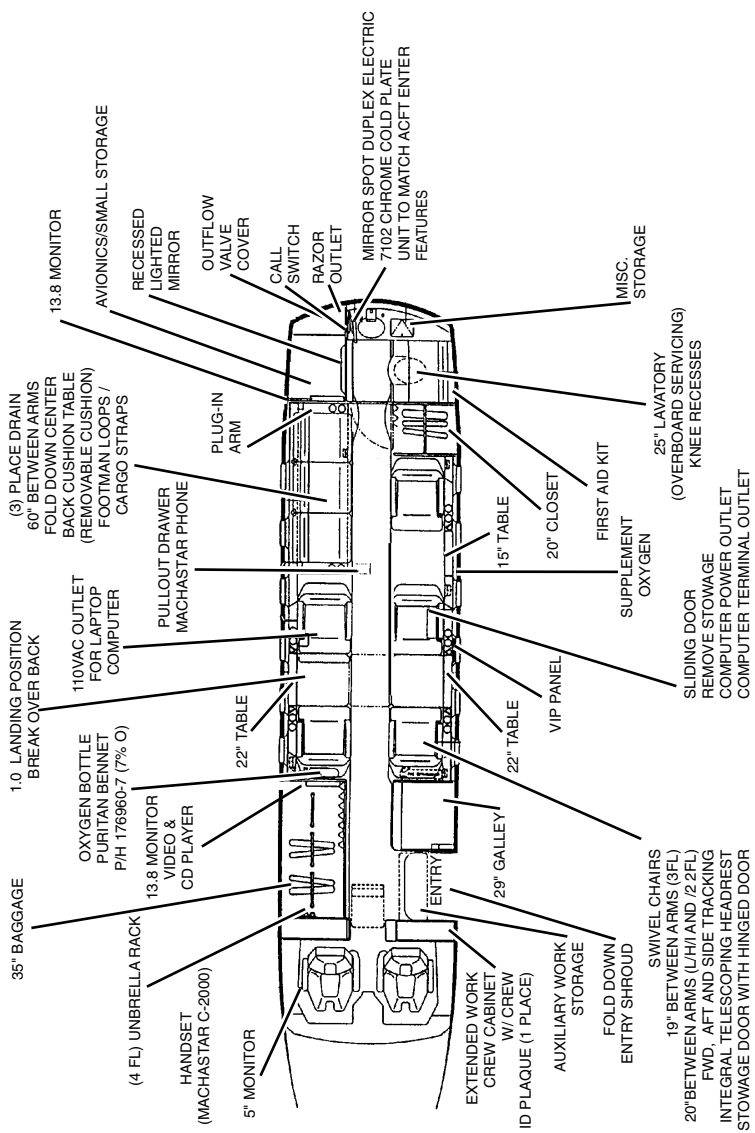

35" BAGGAGE
(4 FL) UNBRELLA RACK
HANDSET (MACHASTAR C-2000)
5" MONITOR
OXYGEN BOTTLE PURITAN BENNET P/H 176960-7 (7% O)
13.8 MONITOR VIDEO & CD PLAYER
1.0 LANDING POSITION BREAK OVER BACK
110VAC OUTLET FOR LAPTOP COMPUTER
PULLOUT DRAWER MACHASTAR PHONE
22" TABLE
(3) PLACE DRAIN 60" BETWEEN ARMS FOLD DOWN CENTER BACK CUSHION TABLE (REMOVABLE CUSHION) FOOTMAN LOOPS / CARGO STRAPS
PLUG-IN ARM
13.8 MONITOR
AVIONICS/SMALL STORAGE
RECESSED LIGHTED MIRROR
OUTFLOW VALVE COVER
CALL SWITCH
RAZOR OUTLET
MIRROR SPOT DUPLEX ELECTRIC 7102 CHROME COLD PLATE UNIT TO MATCH ACFT ENTER FEATURES
MISC. STORAGE
25" LAVATORY (OVERBOARD SERVICING) KNEE RECESSES
15" TABLE
20" CLOSET
FIRST AID KIT
SUPPLEMENT OXYGEN
SLIDING DOOR
REMOVE STOWAGE
COMPUTER POWER OUTLET
COMPUTER TERMINAL OUTLET
VIP PANEL
22" TABLE
29" GALLEY
ENTRY
EXTENDED WORK CREW CABINET W/ CREW ID PLAQUE (1 PLACE)
AUXILIARY WORK STORAGE
FOLD DOWN ENTRY SHROUD
SWIVEL CHAIRS
19" BETWEEN ARMS (3FL)
20"BETWEEN ARMS (L/H/I AND /2 2FL)
FWD., AFT AND SIDE TRACKING
INTEGRAL TELESCOPING HEADREST
STOWAGE DOOR WITH HINGED DOOR

Figure WB-5. Aircraft Floorplan

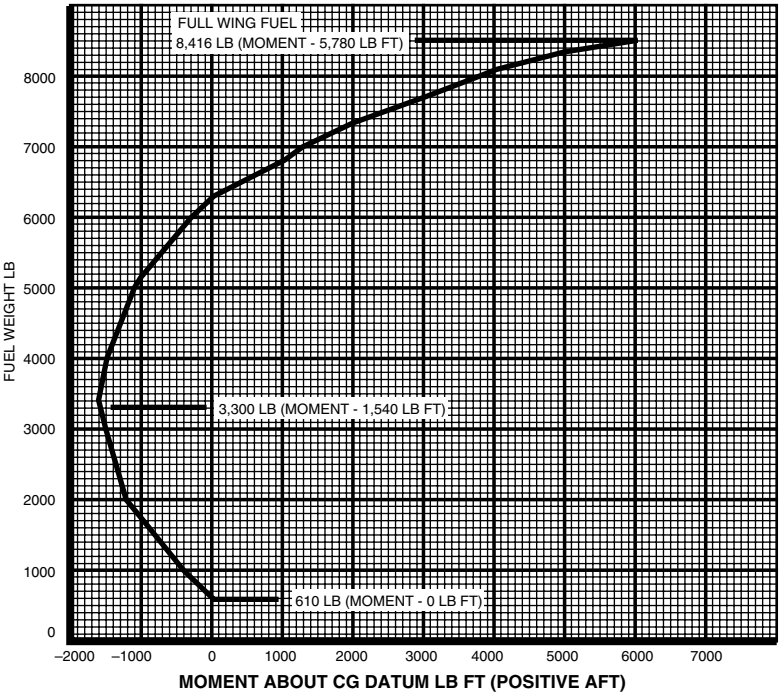


Figure WB-6. Wing Fuel Moment vs. Weight

The weight and moment of full 192 Imperial gallons (230 U.S. gal) ventral tank fuel is 1,536 lb +12,849 lb ft, this, when required must be added to the weight and moment of wing fuel carried.

The total amount of unusable fuel for aircraft fitted with a ventral tank is 10.10 Imperial gallons (12.1 U.S. gal).

Weight ..... 81.0 lb

Lever ..... –0.75 ft

Moment ..... –61 lb ft

In the case of aircraft not fitted with a ventral tank unusable fuel is 9.50 Imperial gallons (11.4 U.S. gal).

Weight ..... 76.0 lb.

Lever arm..... –1.21 ft

Moment ..... –92 lb ft

The unusable fuel above includes a total in each case of 2.75Imperial gallons (3.30 U.S. gal) which is undrainable.

Weight ..... 22.0 lb

Lever arm..... –1.30 ft

Moment ..... –29 lb ft

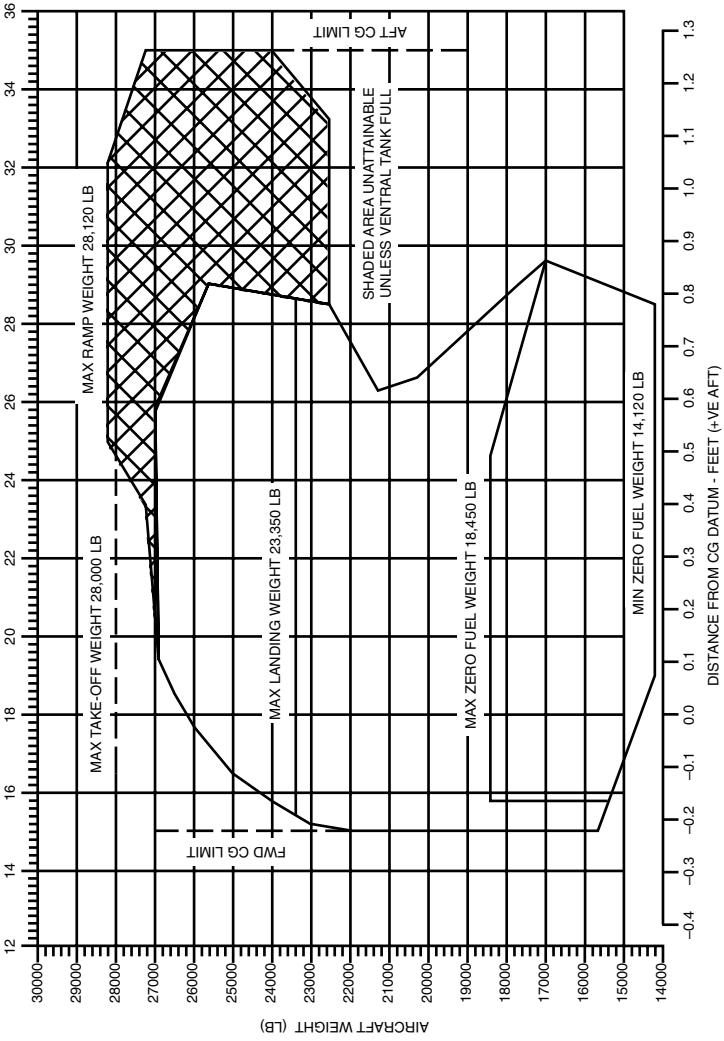

AFT CG LIMIT
SHADED AREA UNATTAINABLE
UNLESS VENTRAL TANK FULL
MAX RAMP WEIGHT 28,120 LB
MAX TAKE-OFF WEIGHT 28,000 LB
MAX LANDING WEIGHT 23,350 LB
MAX ZERO FUEL WEIGHT 18,450 LB
MIN ZERO FUEL WEIGHT 14,120 LB
FWD CG LIMIT
AIRCRAFT WEIGHT (LB)
DISTANCE FROM CG DATUM - FEET (+VE AFT)

Figure WB-7. Center of Gravity Limits

ITEM	WEIGHT (LB)	ARM (FT)	MOMENT (LB-FT)	%MAC
BASIC OPERATING WEIGHT				
PASSENGERS				
Jump Seat				
Seat 1				
Seat 2				
Seat 3				
Seat 4				
Seat 5				
Seat 6				
Seat 7				
BAGGAGE				
WARDROBE				
FORWARD BAGGAGE				
AFT BAGGAGE				
Zero-Fuel Weight				
Wing Fuel Tanks				
Ventral Tank				
Ramp Weight				
Ground Burnoff				
Takeoff Weight				

Figure WB-8. Weight and Balance Worksheet

PERFORMANCE

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PER-69 Ceiling Data **PER-274**

PERFORMANCE

INTRODUCTION

This section contains performance information necessary for operation in compliance with applicable performance requirements, data required by applicable noise regulations and other information essential for implementing special operational requirements.

STANDARD CONDITION OF AIRCRAFT

The performance information given relates to an average aircraft as described in Section 1 of the *Approved Flight Manual* (*AFM*) and powered by two approved turbofan power units listed in Section 2 of the *AFM*.

The surface finish should be average gloss with condition and fit of joints, panels, anti-icing equipment, doors and other externally mounted items being generally good.

The approved flap settings are listed under Configuration.

PROCEDURES AND INFORMATION

Details of the aircraft procedures essential to achieve the performance standard for normal and abnormal operations are given, in Section 4 of the *AFM*, Abnormal and Normal Procedures.

PERFORMANCE

The performance applies to an aircraft fitted with two Allied-Signal Engines TFE731-5BR-1H fitted with an automatic power reserve (APR) system and in the configurations which are stated on the next page. The basic configuration is shown in Figure 1.5, Section 1, *AFM*.

The takeoff performance information is not valid unless the automatic power reserve (APR) system is operative and armed for takeoff.

CONFIGURATION

NORMAL TAKEOFF THRUST

Normal takeoff thrust is verified by the fan rpm (N_1 REF) and is set with thrust levers fully forward.

MAXIMUM (APR) THRUST

With the thrust levers fully forward, maximum (APR) thrust is obtained automatically when the APR is armed and if the N_2 differential between engines exceeds 5%. The APR allows maximum thrust and increases the N_1 up to 1.5%. APR thrust can also be achieved by pressing the APR ARM and APR O/RIDE buttons with thrust levers fully forward.

DERATE TAKEOFF THRUST

Scheduled data is not yet provided.

MAXIMUM CONTINUOUS THRUST

Maximum continuous thrust is defined by fan rpm (compensated N_1), and is scheduled by altitude and air temperature. APR must be disarmed.

AIR CONDITIONING

Engine bleed air for air conditioning is not to be used during takeoff at maximum or normal takeoff thrust.

ENGINE AND INTAKE ICE PROTECTION

Engine and intake ice protection bleeds are to be selected OFF unless account is taken of performance loss in accordance with the Performance information.

NOTE

Throughout this Performance chapter, wherever engine anti-ice bleed is referred to, it shall be taken to read engine intake ice protection bleed.

LANDING GEAR

- During takeoff until airborne ..... Down
- Net takeoff flight path, enroute and approach climbs ..... Up
- Landing and balked landing climb ..... Down

WHEEL BRAKES

Anti-skid is on. Cooling time limits are observed.

AIRBRAKES

Airbrakes are SHUT; except on landing, they are extended to the lift-dump position after touchdown.

THRUST REVERSERS

Stowed during flight. May be deployed on the ground to assist aircraft deceleration. No reduction in stopping distance is credited for the use of thrust reverse.

FLAP SETTINGS

The flap settings are outlined in Table PER-1.

Table PER-1. FLAP SETTINGS

TAKEOFF AND SECOND SEGMENT CLIMB	15° OR ALTERNATIVELY 0°
FINAL TAKEOFF CLIMB	0°
ENROUTE	0°
APPROACH—ALL ENGINES	45°
APPROACH—ONE ENGINE	25°
APPROACH—ABOVE NORMAL WAT LIMIT APPROACH CLIMB (I.E. GO-AROUND)	15° 15° IN CONJUNCTION WITH A 25° APPROACH FLAP SETTING OR 45° LANDING FLAP SETTING; 0° IN CONJUNCTION WITH A 15°APPROACH FLAP SETTING (FOR LANDING ABOVE THE WAT LIMIT ONLY).
BALKED LANDING CLIMB	45°
LANDING	45° OR ALTERNATIVELY 25°
LANDING RUN	75° (LIFT DUMP)

DEFINITIONS

Some of the terms used are defined in Section 1of the *AFM*. Those terms which are used mainly in this Performance chapter are defined as follows.

GROSS PERFORMANCE

This represents the minimum performance which a fleet of aircraft can be expected to achieve if satisfactorily maintained and when flown in accordance with the required techniques. Gross performance data is provided later in this chapter.

NET PERFORMANCE

The majority of the scheduled data is net performance. This is the gross performance diminished by the amount considered necessary to allow for various contingencies which cannot be directly accounted for operationally, such as the need to maneuver, unavoidable variations in piloting techniques, temporarily below average performance, etc. It is unlikely that the net performance will not be achieved in operation providing the aircraft is flown in accordance with the required techniques.

ALTITUDES

All aerodrome or aircraft altitudes throughout the chapter are defined in pressure feet unless specifically stated to the contrary.

REFERENCE HUMIDITY

The relationship between temperature and humidity which defines “reference humidity” (to which the scheduled performance is related) is defined in Table PER-2.

Table PER-2. REFERENCE HUMIDITY

TEMPERATURE	RELATIVE HUMIDITY
AT AND BELOW ISA	80%
BETWEEN ISA AND ISA +28° C	VARIES LINEARLY BETWEEN 80% AND 34%
AT AND ABOVE ISA +28° C	34%

AIR TEMPERATURE

Unless otherwise qualified, this means the true temperature (°C) of the free air near to, but uninfluenced by, the aircraft.

AIRSPEEDS

See Operating Speeds section of this chapter.

PAVED RUNWAY/HARD RUNWAY

Paved or hard runway is defined as a concrete or tarmac surface.

NOTE

Throughout the chapter, reference to a hard runway means a paved surface unless the reference is qualified with the term 'unpaved.'

WET RUNWAY

A runway is considered as wet when it is well soaked but without significant areas of standing water.

A runway is considered well soaked when there is sufficient moisture on the runway surface to cause it to appear reflective.

CLIMB GRADIENT

The ratio is expressed as a percentage:

$$\frac{\text{CHANGE IN HEIGHT}}{\text{HORIZONTAL DISTANCE TRAVELED}} \times 100\%$$

The gradients shown on the charts are true gradients, i.e., they are derived from true (not pressure) rates of climb.

SPEED FOR FLIGHT OVER WATER

For the purpose of compliance with the regulations governing flight over water, the speed should be taken as 400 knots TAS.

FLIGHT IN ICING CONDITIONS

In severe icing conditions, ice can build up on unprotected parts of the aircraft causing buffeting and increased drag which can occur at normal certificated operating speeds. Procedures and speeds associated with those conditions are included in Normal Procedures and Ice and Rain Protection.

WIND COMPONENT/CROSSWIND

A graph to convert wind velocity into a headwind or tailwind component is given in Figure PER-1 (*AFM* Figure 5.05.1).

OPERATION IN HIGH SURFACE WINDS

If the wind speed at a height of 10 meters (33 feet) exceeds 20 knots and has a tail wind component, 70% N_1 should not be exceeded on the ground except during takeoff.

When complying with the above, the following conditions shall be met during takeoff:

- The brakes are released before 70% N_1 is reached.
- The thrust is advanced smoothly so that full thrust is achieved at an aircraft speed of approximately 15 knots.

MAXIMUM DEMONSTRATED CROSSWIND

The maximum crosswind component in which the aircraft has been demonstrated to be satisfactory for takeoff and landing is 30 knots measured at a height of 10 meters (33 feet) above the runway surface. The demonstrations were made with both engines operating and controllability was not found to be limiting. In strong crosswinds, into-wind aileron should be used.

CRITICAL ENGINE

In a zero crosswind takeoff, there is no critical engine. In a crosswind takeoff, the aircraft has normal weathercock stability and tends to yaw into wind. Therefore the critical engine is the one on the upwind side.

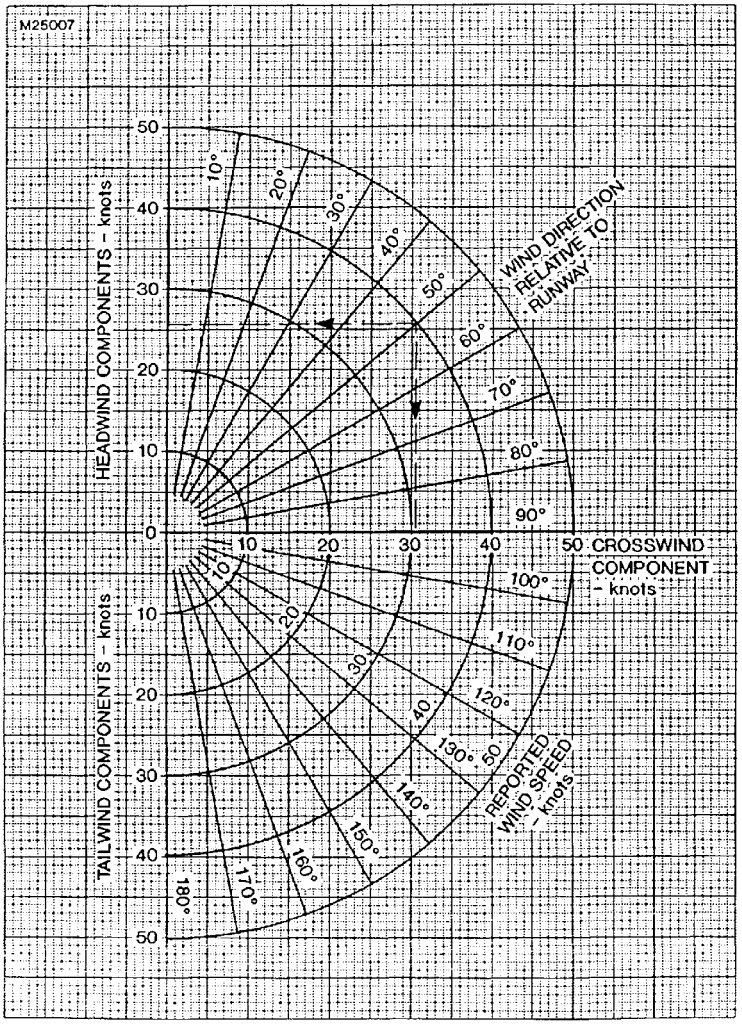


Figure PER-1. Wind Component

NOISE CERTIFICATION

GENERAL

The Hawker 800 XP powered by TFE31-5BR-1H engines has demonstrated compliance with the Appendix C noise certification requirements of FAR Part 36 (Amendment 360-20) which are equivalent to those of ICAO, Annex 16, Volume 1, Chapter 3. The certificated noise levels at the maximum certificated takeoff and landing weights of 28,000 lb (12,701 kg) and 23,350 lb (10,591 kg) respectively are below the Stage 3 limits of FAR 36 as shown in Table PER-3.

NOTE

No determination has been made by the Federal Aviation Administration (FAA) that the noise levels of this aircraft are or should be acceptable or unacceptable for operation at, into or out of any airport.

Table PER-3. NOISE CERTIFICATION—FAR 36 STAGE 3 LIMITS

POSITION	FAR PART 36 STAGE 3 LIMIT (EPNDB)	AIRCRAFT CERTIFICATED NOISE LEVEL (EPNDB)
SIDELINE	94.0	87.1
TAKEOFF WITH CUTBACK	89.0	79.3
APPROACH	98.0	93.3

NOISE ABATEMENT PROCEDURES

Unless otherwise required, the normal takeoff procedures should be used. When the procedures for an aerodrome demand a specific noise abatement technique it should be followed, but the normal maximum pitch angle of 20° should not be exceeded.

If a noise abatement procedure is required but speeds and altitudes are not specified, the 160 knots/20° climb should be maintained up to 1,000 feet above aerodrome elevation, at which point normal climb thrust should be selected.

Where a noise abatement procedure calls for a reduction below normal climb thrust, the reduced thrust used should be not be less than the minimum recommended N_1 for noise abatement climb, as shown in Figure PER-2 (*AFM* Figure 5.05.2).

MINIMUM RECOMMENDED N_1 FOR NOISE ABATEMENT CLIMB

Figure PER-2 shows the minimum recommended % N_1 for use in the noise abatement climb after the reduction of thrust from the takeoff setting. The minimum recommended setting is that which, at maximum takeoff weight, would provide level flight if one engine were to fail. With both engines operating a rate of climb typically between 1,100 and 1,500 fpm will result.

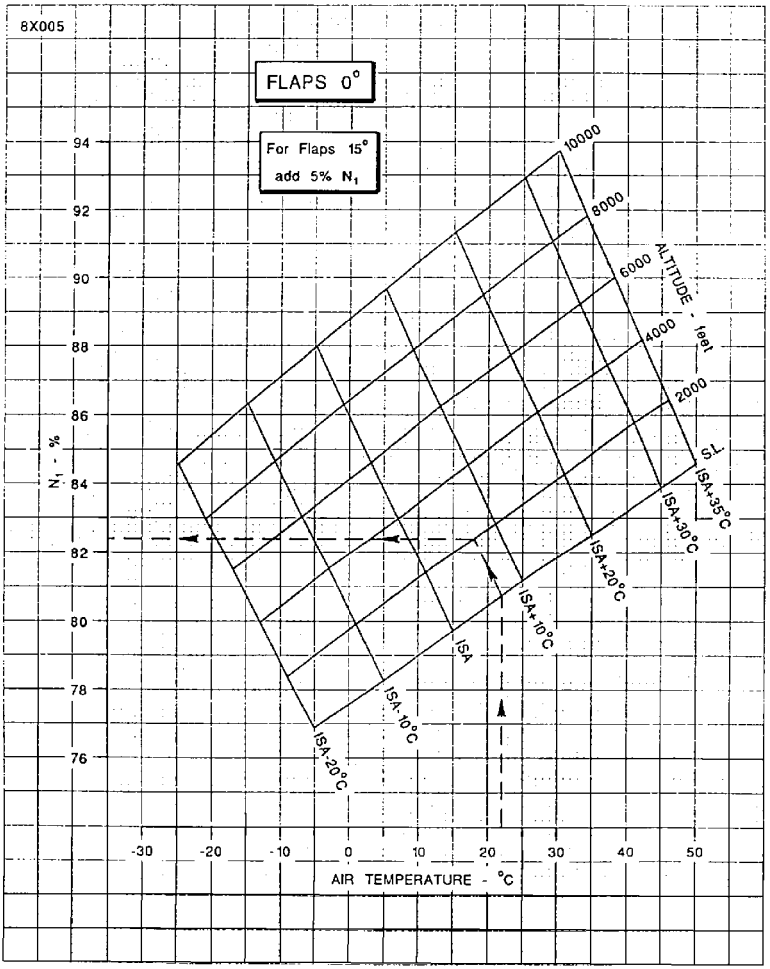


Figure PER-2. Minimum Recommended N_1 For Noise Abatement Climb

INSTRUCTIONS FOR USE OF CHARTS

To determine the % N_1 required:

- Determine the pressure altitude at which it is intended to reduce thrust (i.e., aerodrome pressure altitude plus the height above the aerodrome level at which the thrust reduction is to commence).
- Enter the appropriate chart with the aerodrome temperature.
- Proceed vertically to the aerodrome pressure altitude.
- From this point move parallel to the nearest line of constant temperature relative to ISA until the pressure altitude for thrust reduction is reached. Read the % N_1 required.
- For temperatures below ISA –20° C use the value of % N_1 appropriate to a temperature of ISA –20° C.A

Table PER-4. NOISE CERTIFICATION—ASSOCIATED CONDITIONS

ENGINES	BOTH ENGINES OPERATING
ENGINE BLEED AIR	AIR CONDITIONING BLEED ON; SEE NOTE 1 FOR THE EFFECT OF ENGINE ANTI-ICE BLEED.
FLAPS	0° OR 15° (SEE NOTE 2).
LANDING GEAR	UP
AIRSPEED	160 KNOTS IAS

NOTE:

1. WHEN ENGINE ANTI-ICE BLEED IS IN USE, ADD 0.5% N_1 TO THE % N_1 GIVEN BY THE CHART.
2. FOR FLAPS 15°, ADD 5% N_1 TO THE % N_1 GIVEN BY THE CHART.
3. THE PRESSURE ALTITUDE AT WHICH IT IS INTENDED TO REDUCE POWER MUST NOT BE LESS THAN 1,000 FEET ABOVE THE AERODROME ALTITUDE.
4. BELOW MAXIMUM TAKEOFF WEIGHT THE SAME RPM (% N_1) SETTING WILL RESULT IN A HIGHER RATE OF CLIMB THAN QUOTED ABOVE.
5. THIS TECHNIQUE IS SIMILAR TO THAT USED IN THE NOISE TYPE CERTIFICATION DEMONSTRATION FROM THE CONDITION OF TAKEOFF WITH CUTBACK.

CORRECTION TO OUTSIDE AIR THERMOMETER

Accurate outside air temperature (TAT, SAT and ISA deviation) is output from the air data computers and can be displayed on the MFD, the FMS or a separate cockpit indicator, depending on the cockpit equipment fitted.

If the analog outside air thermometer on the center pedestal is used, a correction must be applied to the indicated temperature to obtain the true temperature. This correction is shown in Figure PER-3 (*AFM* Figure 5.05.8). The curves are based on a correction factor K=0.7.

If the outside air contains water droplets then K reduces (i.e., K<0.7) so that the instrument gives a lower temperature reading which is closer to the true air temperature. In such atmospheric conditions it is recommended that the ADC information be used to display the OAT.

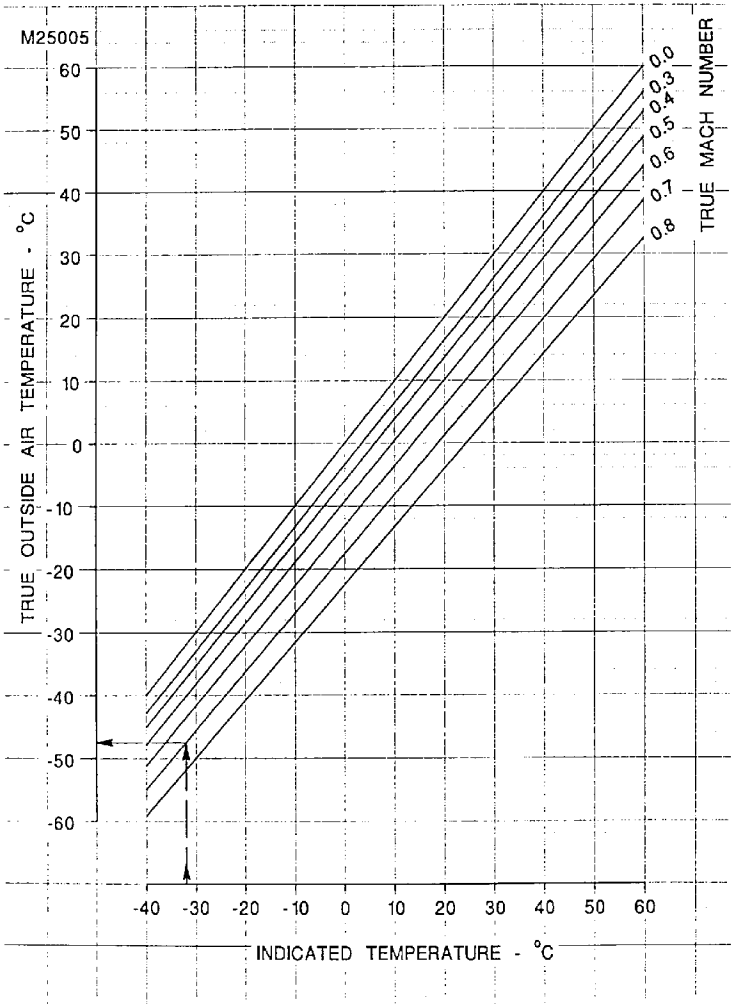


Figure PER-3. Correction to Outside Air Thermometer

ABNORMAL PROCEDURES

APPROACH AND LANDING (ONE ENGINE INOPERATIVE)

The approach should be made at V_{REF} +20 knots with flaps 25°.

At a height of about 200 feet and providing a successful landing seems to be assured, flaps 45° should be selected and the airspeed allowed to fall to V_{REF}. Alternatively, the aircraft may be landed with flaps 25°, using a landing reference speed of V_{REF} +5 knots IAS. In this case, lift dump will not be available after touchdown. At light weights, V_{REF} should be increased to 111 knots IAS to allow adequate control in the event of a discontinued approach.

APR power may be used, but is not necessary to meet the limits for landing weight, altitude and temperature (WAT) given in the Landing WAT Data section of this chapter. If APR power is required, press the APR ARM switch and check that both APR ARMED (white) and APR (green) legends come on. APR power will be available immediately during the remainder of the approach and in the event of a subsequent go-around.

Reverse thrust on the operative engine may be used on the ground and it is recommended that the reverser on the inoperative engine is deployed, if possible, to reduce the asymmetric effect on handling.

GO-AROUND (ONE ENGINE INOPERATIVE)

To discontinue an approach, set the thrust lever of the operative engine fully forward. Select flaps 15° (from flaps 45° or 25°) or flaps 0° (from flaps 15°) and retract the landing gear. Rotate the aircraft to an attitude of approximately 12°. The speed should be maintained at final approach speed during the climbout. Do not allow speed to reduce below V_{REF} with flaps 15° or V_{REF} +10 knots with flaps 0°.

- Under limiting performance conditions, it is more important to establish a climb and retract the landing gear than to increase airspeed above the minimum.

- The airworthiness requirements do not ensure that there will be a positive climb performance in the final landing phase with an engine inoperative. Therefore, the decision to discontinue the approach should be made before the flaps are extended to 45°.

EMERGENCY OVERWEIGHT LANDING

If it is necessary to make a landing at a weight in excess of maximum landing weight, use normal techniques for approach and landing, touching down as smoothly as possible. For the purpose of brake cooling, an overweight landing should be considered as a rejected takeoff.

LANDING ABOVE WAT LIMIT WITH ONE OR BOTH ENGINES OPERATING

If a landing has to be made shortly after takeoff at a weight at or close to the maximum given in Figure 5.15.1 of the *AFM* (or Figure PER-16), where the required approach climb gross gradient of 2.1% cannot be met with flaps 15° (see Figure 5.55.3 of the *AFM* or Figure PER-57), an alternative landing procedure is required.

The approach should be made with flaps 15° at V_{REF} +25 knots. When a successful landing appears to be assured, flaps 25° should be selected and airspeed allowed to fall to V_{REF} +5 knots at the threshold. Airbrakes should be selected open immediately after touchdown.

When landing with an inoperative engine, reverse thrust on the operative engine may be used on the ground and it is recommended that the reverser on the inoperative engine is deployed, if possible, to reduce the asymmetric effect on handling.

NOTE

- Lift dump is not available with flaps 25°.
- All reference to V_{REF} means the V_{REF} appropriate to flaps 45° and as defined in Subsection 5.10 of the *AFM*.

PROCEDURE WITH ENGINE FUEL COMPUTER INOPERATIVE

When landing with either or both engines in manual mode, special care should be taken on account of the slow engine acceleration achievable. According to the conditions, slam-acceleration from idle to takeoff power may take from 10 to 25 seconds. To minimize acceleration time, on the affected engine(s) ENG ANTICE should be selected OFF and the MAIN AIR VLV selected CLOSE whenever possible.

FLAPLESS LANDING

In the event of a failure making it impossible to extend the flaps, the landing gear should be lowered when airspeed is reduced below 220 knots IAS to improve speed stability. The final approach should be made at V_{REF} +30 knots. As the runway is approached thrust should be reduced so that the threshold is crossed at V_{REF} +15 knots. The nosewheel should be lowered to the runway surface immediately after touchdown, the airbrakes opened (if available), wheel brakes applied and reverse thrust used as for a normal landing.

When landing in icing conditions with flaps 0°, a further 15 knots should be added to the speeds (i.e. final approach at V_{REF} +45 knots and the threshold is crossed at V_{REF} +30 knots). The landing distance is approximately twice the normal flaps 45° distance.

LANDING WITH ASYMMETRIC AIRBRAKE

If, as a result of a failure, asymmetric airbrake is suspected, the subsequent landing should be made as a flapless landing using the techniques and airspeeds given above. The use of flaps is not recommended as a large aileron angles will be necessary at low airspeed with flaps lowered.

LANDING BY USE OF TRIM SYSTEM

Should failure of any one of the primary flying controls occur, the following landing technique is recommended.

Maneuvering in the circuit should be made at about 160 knots IAS with flaps 15° and the landing gear down. Steep turns should be avoided. A long final approach should be made with flaps 45° at V_{REF} +10 knots.

If rudder circuit has failed, the yaw damper must be switched off before touchdown.

If the elevator primary control has failed, airspeed may be controlled by the elevator trim and the rate of descent by the thrust levers. The final stage of the approach should be fairly flat and touchdown made by slowly closing the thrust levers. It has been demonstrated that elevator trim remains effective during the landing flare.

If both primary rudder and elevator control are lost together with a single-engine failure, make the approach at V_{REF} +20 knots, flaps 25°, and landing gear down. This airspeed should be maintained to the threshold and a landing made with flaps 25°.

NOTE

While it is normal to select flaps 45° on a single-engine landing, it is considered unwise to create a trim change at a late stage of the approach when direct elevator control has been lost.

If the aileron control has failed, it is recommended that the rudder be used for lateral control. However, it may be possible to use the aileron trim control depending on the type of failure. Unless the port aileron itself has jammed, normal use of the trimmer will give some lateral control; the amount depends on how much of the circuit is free to stretch. Should lateral control be seriously impaired, it is recommended that landing be made with flaps 0°. The final approach speed should not be less than V_{REF} +25 knots; a greater speed may be needed to retain sufficient lateral control.

NORMAL PROCEDURES

FLIGHT IN TURBULENT AIR

General

Severe turbulence may be classified into two groups, as follows:

- Clear air and nonstorm turbulence
- Storm turbulence

Whenever possible, severe turbulence should be avoided.

In all types of turbulence it is important to avoid actions which could give rapid changes in attitude, altitude or airspeed; whenever possible, achieve a steady condition before entry into turbulence.

Apart from the actions detailed below, pilot control movements should be kept to the minimum and restricted to limiting long term changes in attitude and airspeed. All control actions should be small and gentle and use of the trimmers should be restricted to compensating for intentional change of airspeed. The aircraft should be flown through turbulence on a straight course or, if this is not practicable, bank angles should be limited to approximately 15°. The autopilot in TURB mode and yaw damper may be used in storm turbulence at the pilot's discretion but the autopilot CLIMB, DESCEND, ALT and SPEED modes must not be engaged.

NOTE

The high, true airspeed of which the aircraft is capable can considerably increase the extend of the damage to airframe and engines which may result from encountering hail.

Flight Procedure

Clear Air and Nonstorm Turbulence

Airspeed need not be reduced except for reasons of passenger comfort. If it is changed it is recommended that an airspeed of 230 knots IAS or 0.70 Mach indicated be used.

Storm Turbulence

If it is not certain that the conditions are nonstorm, then they must be assumed to be storm turbulence.

When Severe Turbulence is Forecasted or Expected

The weight/altitude limitation shown in Figure PER-4 (*AFM* Figure 4.10.4) should be observed for that part of the flight where severe turbulence is expected in order to avoid the possibility of encountering heavy buffet. The aircraft should be stabilized at 230 knots IAS or 0.70 Mach indicated, as appropriate, before entry into the area of turbulence.

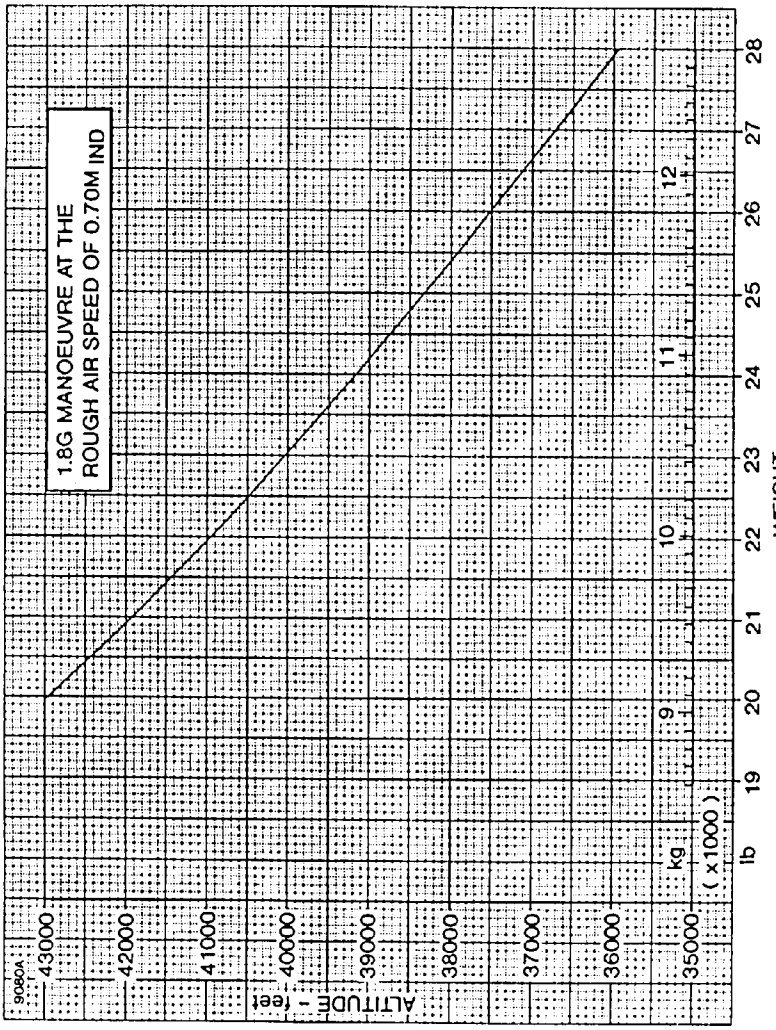


Figure PER-4. Maximum Altitude for Flight When Storm Turbulence May Be Expected

Where a change to the flight path is made to avoid a region of storm turbulence, it shall be assumed that severe turbulence might still be expected for the purpose of defining the maximum allowable altitude.

When Severe Turbulence Is not Forecasted or Expected

Airspeed should be changed slowly to 230 knots IAS or 0.70 Mach indicated, as appropriate at constant altitude.

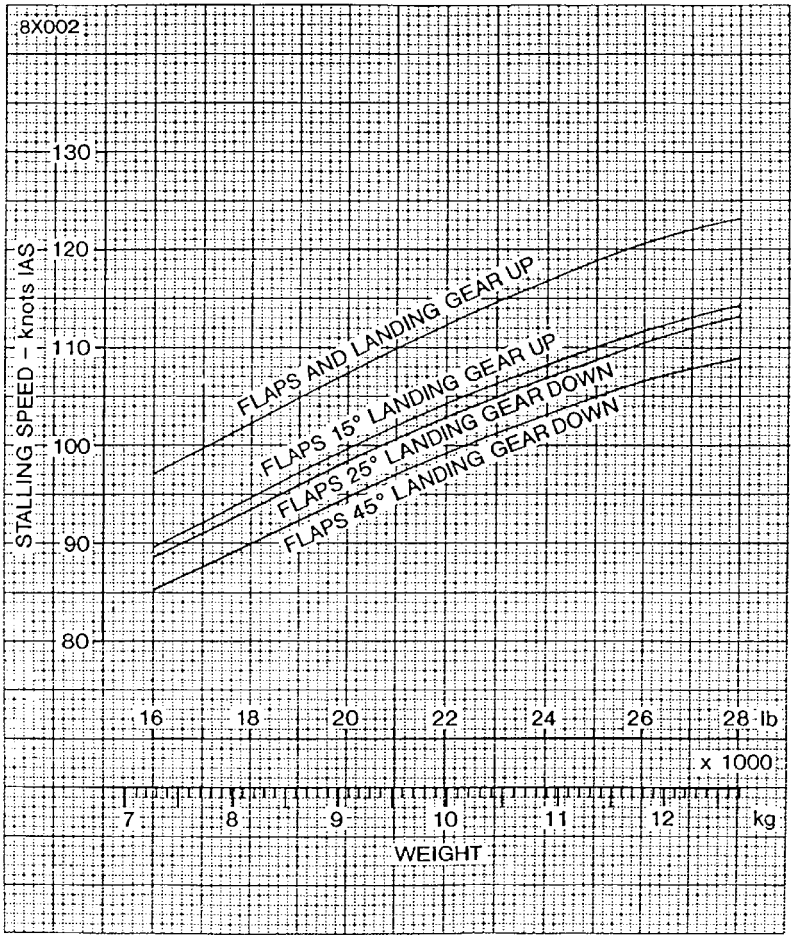


Figure PER-5. Power Off Stalling Speeds

STALLS

Procedure

When intentional stalls are carried out, the following conditions apply:

1. The altitude must be between 10,000 and 18,000 feet.
2. The autopilot must be disengaged.
3. The stall identification system must be inoperative.
4. All external surfaces must be free from ice.
5. The ventral fuel tank must be empty.
6. The weather radar, if fitted, must be at standby.

Stalls may be demonstrated with the yaw damper switched on or off.

To limit the height loss, to maintain acceptable stalling characteristics and to prevent structural abuse, it is strongly recommended that the procedure given below should be followed.

Technique

The stalling technique is as follows:

1. All stalls are to be made in straight (wings level) flight.
2. Stalls with flaps retracted and in the takeoff configuration should be carried out at idle thrust. To reduce altitude loss with approach or landing flaps, thrust should be adjusted not to exceed 77% N_1. Once thrust is set, it should not be reduced during the approach to the stall and recovery.
3. The aircraft should be trimmed at an airspeed of approximately 1.4 V_S in the appropriate configuration after setting the required thrust.
4. The airspeed should be reduced at not more than one knot per second. Rapid or violent movements of any control during the approach to the stall should be avoided particularly at airspeeds below the operation of the stick shaker. With the yaw damper off, any tendency to yaw during the approach to the stall should be corrected by normal use of the rudder.
5. The stall is identified by a short forward movement of the control column provided by the stall identification system. The red STALL VLV OPEN annunciators to the left of each main attitude display will come on. The aircraft should be allowed to pitch nosedown until the stick push has cancelled, and should then be recovered to normal controlled flight. Any tendency to roll should be corrected by use of ailerons. Do not attempt to hold the aircraft in the stall.

Characteristics

There is no natural stall warning or aerodynamic buffet prior to the stall. Stall warning is provided by a stick shaker which is set to operate at an indicated airspeed of 7% to 9% above the stalling speed. It is acceptable for stick pusher operation to be coincident with the natural stall, provided that any rolling tendency can be restrained to within 20° of bank angle by normal use of ailerons. Some aerodynamic buffet may occur briefly at the point of stall.

Power-off stalling speeds in terms of indicated air speed (IAS are given for various configurations on Figure PER-5 (*AFM* Figure 4.10.5). These airspeeds apply to an altitude of 15,000 feet and are the stall identification speeds at forward CG and therefore differ from the values shown in Figure 5.10.6 of the *AFM* which are based on the minimum airspeed obtained during the stall.

ICE AND RAIN PROTECTION SYSTEMS

General

If ice has formed on the airframe prior to approach, or icing conditions exist, the flight speeds for use on approach are provided in Landing in Icing Conditions in section 4 of the *AFM*.

Before Takeoff

Prime the airframe ice protection system by setting the WING/TAIL ANTICE time switch to run the pump for two minutes. Check that priming is complete before starting the takeoff.

If the outside air temperature is 10° C or below is associated with conditions of high humidity, (i.e., mist or fog reducing visibility to approximately one mile or 1,600 meters), or with a wet runway surface, set ENG ANTICE 1 and 2 and ENG IGNITION 1 and 2 to ON.

NOTE

ENG ANTICE 1 and 2 should be selected ON before setting takeoff thrust.

When takeoff is made with ENG ANTICE 1 and 2 selected ON, ITT must be monitored during takeoff and initial climb. Allowance must be made for the use of ENG ANTICE on performance by reference to the appropriate figures in subsection 4.10 and section 5 of the *AFM*. If necessary, the airframe WING/TAIL ANTICE switch may also be selected on for takeoff. Switch ENG ANTICE 1 and 2 and the ENG IGNITION 1 and 2 to OFF when conditions permit.

NOTE

There is a fuel penalty when the engine anti-ice systems are in use.

Whether in icing conditions or not, the SCREEN HEAT L and R and the PITOT/VANE HEAT L and R should be selected ON in flight. The ICE DET switch should normally be set to AUTO.

In Flight

Maintain the airframe system in the fully primed condition (see NOTE 1).

If icing conditions are present or expected, proceed as follows:

- ENG IGNITION 1 ..... ON
- ENG ANTICE 1 ..... ON
- WING/TAIL ANTICE ..... SELECT

Select before entering icing and set for 10 minutes (see NOTE 1 and 2).

- Airspeed ..... ADJUST TO 230 KIAS

Adjust airspeed to 230 knots IAS (see NOTE 3).

- ENG IGNITION 2 ..... ON
- ENG ANTICE 2 ..... ON
- ENG 1 and 2 A/ICE Annunciators ..... EXTINGUISHED

Monitor during flight in icing conditions.

NOTE

1. The airframe system should be maintained fully primed by selecting it on for 30 seconds at the start of climb, for two minutes at the top of descent, and, if icing conditions are expected, preferably for two minutes prior to entering icing conditions.

2. If icing conditions still prevail or are expected, a further period of operation should be selected prior to the time switch reaching zero. Termination of the WING/TAIL ANTICE selection will be given by an audio chime.

3. This is a recommended speed. However, if it is necessary to take advantage of the full range of airspeeds permitted for flight in icing conditions and if other conditions permit, the airspeed may be adjusted to within the limits given in Figure PER-6 (*AFM* Figure 4.10.6).

4. Allowance should be made for the adverse effect of the engine anti-icing system upon cruise, hold and balked landing performances (see section 5 of the *AFM*).

5. With either of the ENG ANTICE switches selected ON in flight, the windscreen temperature is increased to provide windscreen ice protection. This increase is not provided when the aircraft is on the ground.

Descent

When descending into icing conditions, select the airframe ice protection system on two minutes before entering icing (approximately 5,000 ft above cloud). With ENG ANTICE selected in flight and thrust lever at idle, a raised N_2 is automatically applied at which adequate intake and engine anti-ice is available.

NOTE

- The procedural use of flap 15° for descent and holding is not permitted in icing conditions.

- In icing conditions, ice may accumulate on the unprotected areas between the TKS panels on the leading edge of the wings.

Leaving Icing Conditions

- ENG ANTICE 1 and 2..... OFF
- ENG IGNITION 1 and 2..... OFF
- WING/TAIL ANTICE Time Switch..... ZERO

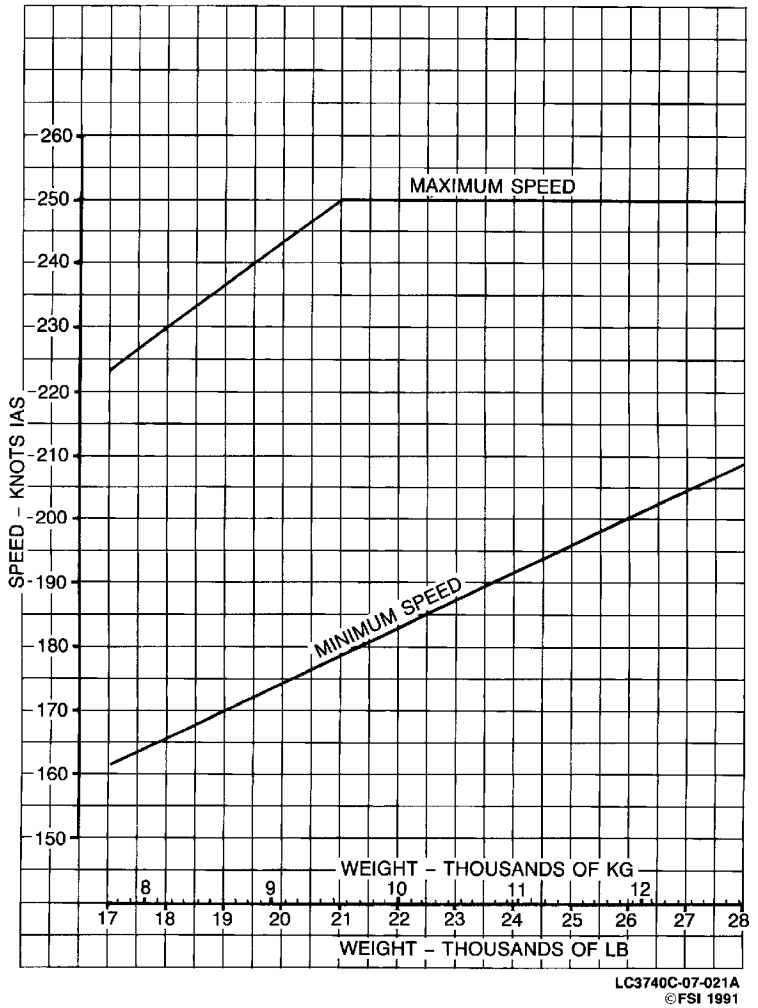


Figure PER-6. Speed for Use in Icing Conditions

WHEEL BRAKES

General

The normal wheel brake system embodies Maxaret anti-skid units which automatically reduce the brake pressure should a wheel tend to skid. As the Maxaret unit does not operate until the wheel is revolving, the brakes must not be applied before touchdown. It should be noted that the emergency braking system bypasses the anti-skid units and therefore care should be exercised when using this system.

If any of the wheels' fusible plugs blow, the brakes must be inspected and certified serviceable before the next takeoff.

The brakes are of adequate capacity to bring the aircraft to a stop under all circumstances (including a rejected takeoff from V_1) provided that the procedures stated below have been carried out.

Cooling Times

After the aircraft has made a normal landing or a stop from a rejected takeoff, a waiting period should be established to ensure that the brakes are both sufficiently cool and in a serviceable condition for a further rejected takeoff (critical case).

After Normal Landing

The required waiting period from completion of taxi-in from landing to before start of taxi-out for takeoff is 5 minutes, except when the takeoff weight exceeds the values given in Table PER-5. When the weight exceeds these values, a period of 30 minutes must be allowed.

Table PER-5 is based on still air and a downhill slope not exceeding 1/2 %. Corrections for more adverse conditions are given in the table NOTE.

After Rejected Takeoff

Required waiting period (from completion of taxi-in following a rejected takeoff from a speed of 90 knots or less, to before start of taxi-out for takeoff) follows:

- After a single rejected takeoff..... 25 MINUTES
- After two or more successive rejected takeoffs..... 45 MINUTES

If the rejected takeoff is made from a speed greater than 90 knots IAS, the brakes must be inspected and certified to be serviceable before the next takeoff.

Table PER-5. BRAKE COOLING LIMITS

AERODROME ALTITUDE FEET	TEMPERATURE ° C						
	–10	0	10	20	30	40	50
	TAKEOFF WEIGHT LB						
10,000	22,300	21,900	21,500	21,100	19,500		
9,000	22,800	22,400	21,900	21,600	20,300		
8,000	23,300	22,800	22,400	22,000	21,100		
7,000	23,800	23,300	22,900	22,400	21,900		
6,000	24,300	23,800	23,300	22,900	22,500	20,900	
5,000	24,700	24,200	23,800	23,300	22,900	21,600	
4,000	25,200	24,700	24,300	23,800	23,400	22,400	
3,000	25,700	25,200	24,700	24,300	23,800	23,100	
2,000	26,300	25,700	25,200	24,700	24,300	23,900	
1,000	26,800	26,200	25,700	25,200	24,700	24,300	23,300
SL	27,300	26,700	26,200	25,700	25,200	24,800	24,100

NOTE:
1. IN 1–5 KNOTS TAILWIND SUBTRACT 500 LB.
2. IN 6–10 KNOTS TAILWIND SUBTRACT 1,500 LB.
3. IF THE DOWNHILL SLOPE EXCEEDS 1/2 %, SUBTRACT 500 LB.

Crew Training

The waiting times obtained by Table PER-5 on the above relate to normal operations in which the brakes and tires have time to cool between landings. If repeated braked landings are made for crew training or any other reason, the brakes and tires may not have time to cool between runs and their temperatures may rise to an undesirable level. The following restrictions should therefore be observed.

Heavy braking should not be used more than necessary for the purpose of the exercise, and the landing gear should be extended as long as possible—never less than 5 minutes in each circuit.

Landings with light braking may be repeated at intervals of not less than 15 minutes. After a landing with heavy braking, one or more touch and go circuits should be done, and a time of 30 minutes should elapse before the next braked landing.

THRUST REVERSERS

Before the first flight of the day, the thrust reversers and associated annunciators should be checked for correct operation. With the RUDDER BIAS A and B on, confirm that selection of thrust reverse on each engine in turn inhibits the rudder bias system.

If the thrust reverser system is know to be inoperative or unserviceable, it must be disabled and locked in the forward thrust position.

The thrust reversers should be armed (ARM annunciator illuminated) before each flight unless the system is inoperative or unserviceable.

Reverse thrust should only be used when the main and nose gears are on the ground.

Movement of the thrust levers above IDLE is inhibited during thrust reverser deployment and stowage, the UNLCK annunciators will illuminate when the thrust reverser doors are not locked in the stowed position. When the thrust reversers' doors are fully deployed and fan flap doors extended, the REVSR annunciator will illuminate and the UNLCK annunciator remains illuminated.

Maximum reverse thrust is automatically controlled at approximately 65% N_1.

MISCELLANEOUS PROCEDURES

Flights in Excess of M_{MO}

As permitted by the limitations in Section 2 of the *AFM*, M_{MO} may be exceeded when authorized for the purpose of pilot training or routine test flights provided the following conditions are observed:

- Passengers are not carried.
- The maximum airspeed is an indicated mach number of 0.82.
- The altitude should be at least 30,000 feet throughout the maneuver with wings level and no applied g.
- There is no significant turbulence.

Commence the maneuver in level flight by selecting maximum continuous power and then depress the nose gently. Recovery action is to reduce power to idle, extend the airbrakes and carry out a gentle pull up.

If a mach number greater than 0.82 indicated or an airspeed greater than 20 knots above V_{MO} is inadvertently achieved, or if any airframe or aileron buffet is encountered, take recovery action immediately.

Flights in Excess of V_{MO}

It is permissible (for the purpose of pilot training or routine test flights) to exceed the maximum operating speed V_{MO} (as stated in Section 2 of the *AFM*) by 20 knots providing:

- Passengers are not carried.
- There is no significant turbulence.
- The altitude is not greater than 20,000 feet.

If a mach number greater than 0.82 M indicated or an airspeed greater than 20 knots above V_{MO} is inadvertently achieved, or if any airframe or aileron buffet is encountered, take recovery action immediately.

Maneuvering at High Altitudes

Figure PER-7 (*AFM* Figure 4.10.7), Buffet Boundary, defines for a given Mach number and altitude the cruising weight at which the maximum demonstrated buffet level will be reached in a 1.5 g maneuver or at which buffet onset will be reached in a 1.3 g maneuver, whichever occurs first.

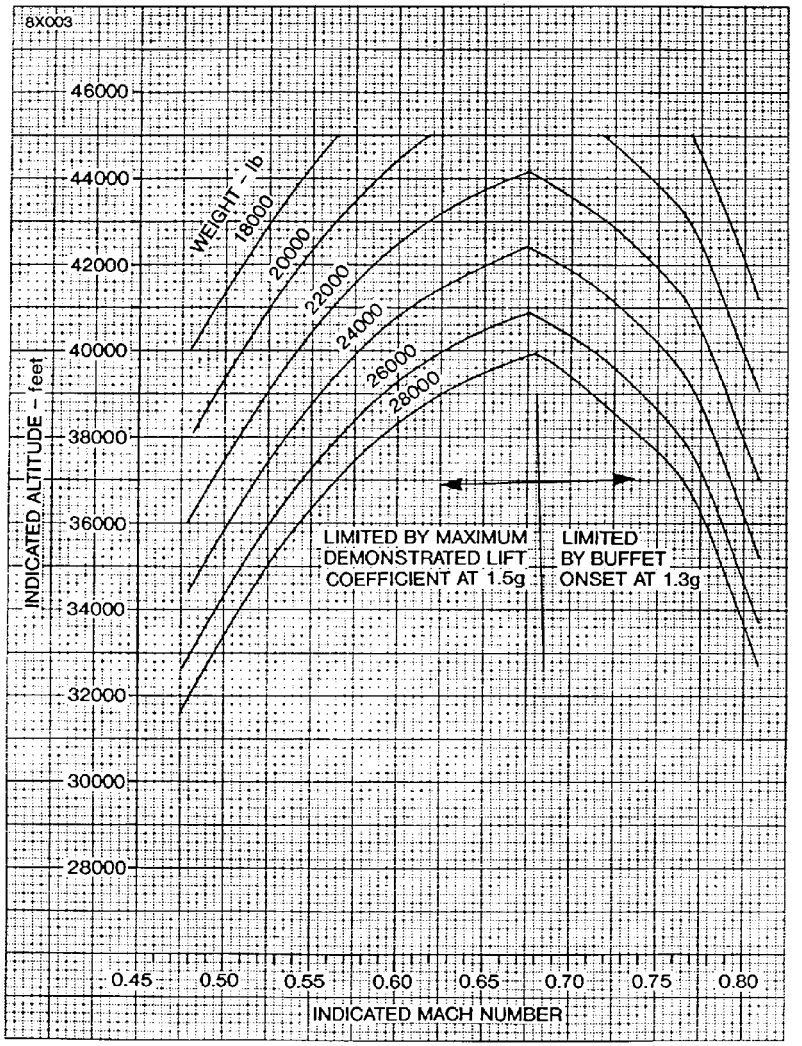


Figure PER-7. Buffet Boundary

Table PER-6. OPERATING SPEEDS—DEFINITIONS

V_{MCG}	THE MINIMUM CONTROL SPEED AFTER AN ENGINE FAILURE ON OR NEAR THE GROUND DURING A CONTINUED TAKEOFF WITH FLAPS 15° OR 0° IS 115.5 KNOTS IAS AT SEA LEVEL, ISA CONDITIONS. THIS SPEED HAS BEEN ESTABLISHED WITHOUT THE ASSISTANCE OF NOSEWHEEL STEERING; THE AIRCRAFT HAVING BEEN ROTATED AT THE NORMAL V_R.
V_{MCA}	THE MINIMUM CONTROL SPEED AWAY FROM GROUND EFFECT WITH FLAPS 15°, IS 108 KNOTS IAS AND WITH FLAPS 0°, IS 114 KNOTS IAS AT SEA LEVEL, ISA CONDITIONS.
V_{MCL}	THE MINIMUM CONTROL SPEED WITH FLAPS 45° IS 105 KNOTS IAS. THE MINIMUM CONTROL SPEED WITH FLAPS 25° IS 106 KNOTS IAS.
V_1	THE TAKEOFF DECISION SPEED (POWER FAILURE RECOGNITION SPEED) MUST NOT BE LESS THAN V_{MCG} OR GREATER THAN V_R. MINIMUM V_1 IS SHOWN IN FIGURES PER-8 THROUGH PER-11 FOR FLAPS 15° AND 0° RESPECTIVELY.
V_R	ROTATION SPEED IS THE SPEED AT WHICH THE PILOT SHOULD INITIATE A CHANGE IN AIRCRAFT ATTITUDE WITH THE INTENTION OF LEAVING THE GROUND. V_R IS DETERMINED AT LOW WEIGHTS AS 1.05 X MINIMUM NOSEWHEEL RAISING SPEED OR AS 1.1 X MINIMUM UNSTICK SPEED. FOR FLAPS UP, V_R IS DETERMINED AT HIGHER WEIGHTS BY THE NEED TO ACHIEVE V_2 AT 35 FEET IN THE EVENT OF AN ENGINE FAILURE. AT HIGH THRUST CONDITIONS OF LOW ALTITUDE AND LOW TEMPERATURE THE MINIMUM V_R REQUIREMENTS OF MINIMUM V_1 FOR FLAPS 15° OR 1.05 V_{MCA} FOR FLAPS 0° ARE CRITICAL. V_R IS SHOWN IN FIGURES PER-8 THROUGH PER-11 FOR FLAPS 15° AND 0° RESPECTIVELY.
V_2	THE TAKEOFF SAFETY SPEED, V_2, IS EQUAL TO V_R PLUS THE INCREMENT IN SPEED ATTAINED PRIOR TO REACHING 35 FEET WITH AN ENGINE FAILURE.FOR FLAPS UP, V_2 IS EQUAL TO THE SPEED NECESSARY TO ACHIEVE A SECOND SEGMENT CLIMB GRADIENT OF 2.4%, IF THIS IS HIGHER. AT HIGH THRUST CONDITIONS, V_2 IS RELATED TO V_{MC}. V_2 IS SHOWN IN FIGURES PER-8 THROUGH PER-11 FOR FLAPS 15° AND 0° RESPECTIVELY.
V_{FTO}	THE FINAL TAKEOFF CLIMB SPEED V_{FTO} IS SHOWN IN FIGURE PER-12.
V_{ERC}	THE ENROUTE CLIMB SPEED V_{ERC} IS SHOWN IN FIGURE PER-13.
V_{REF}	THE LANDING REFERENCE SPEED IS THE SPEED AT WHICH THE PILOT SHOULD AIM TO CROSS THE RUNWAY THRESHOLD WITH FLAPS AT 45°. V_{REF} IS SHOWN IN FIGURE PER-14.
V_S	VARIOUS SCHEDULED SPEEDS ARE BASED ON THE POWER OFF STALLING SPEED (DEFINED AS THE MINIMUM SPEED IN A STALL). V_S IS SHOWN IN FIGURE PER-15 IN TERMS OF EQUIVALENT AIRSPEED (EAS).

NOTE:

At higher altitudes and/or temperatures, the values of V_{MCG}, V_{MCA} and V_{MCL} decrease.

OPERATING SPEEDS

INTRODUCTION

The operating speeds are provided in this section, relevant to the certificated performance of the aircraft. Operating Speed definitions are listed in Table PER-6.

INSTRUCTIONS FOR USE OF CHARTS

To Determine Minimum V_1, V_R and V_2

- Determine the appropriate takeoff speed chart:
  - Flaps 15°, APR ON, Figures PER-8 and PER-9 (*AFM* Figures 5.10.1 and 5.10.1a)
  - Flaps 0°, APR ON, Figures PER-10 and PER-11 (*AFM* Figures 5.10.2 and 5.10.2a)
- Enter the appropriate chart with the air temperature. When engine anti-ice is in use, enter the chart with a temperature 10° C above the actual air temperature.
- Move up to the aerodrome altitude and then proceed horizontally across the chart.
- For flaps 15°:
  - Intersect the minimum V_1 curve (labeled "MINIMUM V_1 and MINIMUM V_R"). Move down from the intersection and read the airspeed from the "MINIMUM V_1—knots IAS" scale.
  - Intersect either the minimum V_1 curve (labeled "MINIMUM V_1 and MINIMUM V_R") or the V_R curve for the appropriate aircraft weight. Move down from the intersection and read the airspeed from the "V_R—knots IAS" scale.
  - Intersect either the minimum V_2 curve (labeled "MINIMUM V_2") or the V_2 curve for the appropriate aircraft weight. Move down from the intersection and read the airspeed from the "V_2—knots IAS" scale.
- For flaps 0°:
  - Intersect the "MINIMUM V_1, MINIMUM V_R and MINIMUM V_2" curves and in each case move down to read the speed from the bottom scale.
  - From the intersection of the air temperature with aerodrome altitude, proceed horizontally across the chart to intersect the takeoff weight in the V_R and V_2 grids. In both cases move vertically from the intersection to the reference line at the bottom of the chart.

- From the reference line move parallel to the guidelines to the required aerodrome altitude, and then read V_R and V_2 from the scales at the bottom of the chart.
- If the values of V_R and V_2 are less than the values of minimum V_R and minimum V_2 then the minimum V_R and minimum V_2 values must be used.

To Determine Final Takeoff Climb Speed (V_{FTO})

- Enter Figure PER-12 (*AFM* Figure 5.10.3) with the aircraft weight.
- Move up the chart and intersect the curve.
- Move horizontally across the chart and read the "FINAL TAKEOFF CLIMB SPEED—knots IAS" scale.

To Determine Enroute Climb Speed (V_{ERC})

- Enter Figure PER-13 (*AFM* Figure 5.10.4) with the aircraft weight.
- Move up the chart and intersect the curve.
- Move horizontally across from the intersection and read the "SPEED—knots IAS" scale.

To Determine Landing Reference Speed (V_{REF})

- Enter Figure PER-14 (*AFM* Figure 5.10.5) with the aircraft weight.
- Move up the chart and intersect the curve.
- Move horizontally across the chart and read the "SPEED—knots IAS" scale.

To Determine Power Off Stalling Speeds (V_S)

- Enter Figure PER-15 (*AFM* Figure 5.10.6) with the aircraft weight.
- Move up and intersect the curve appropriate to the required configuration.
- Move horizontally across the chart to the reference line and then parallel with the guidelines to the aerodrome altitude intersection.
- Move horizontally across the chart from the intersection of the aerodrome altitude and read the "STALLING SPEED—knots EAS" from the right hand scale.

NOTE

V_S is determined at the forward center-of-gravity limit, including the variation with weight, as given in Figure 2.1 of the *AFM*. V_S will decrease as the center of gravity moves aft.

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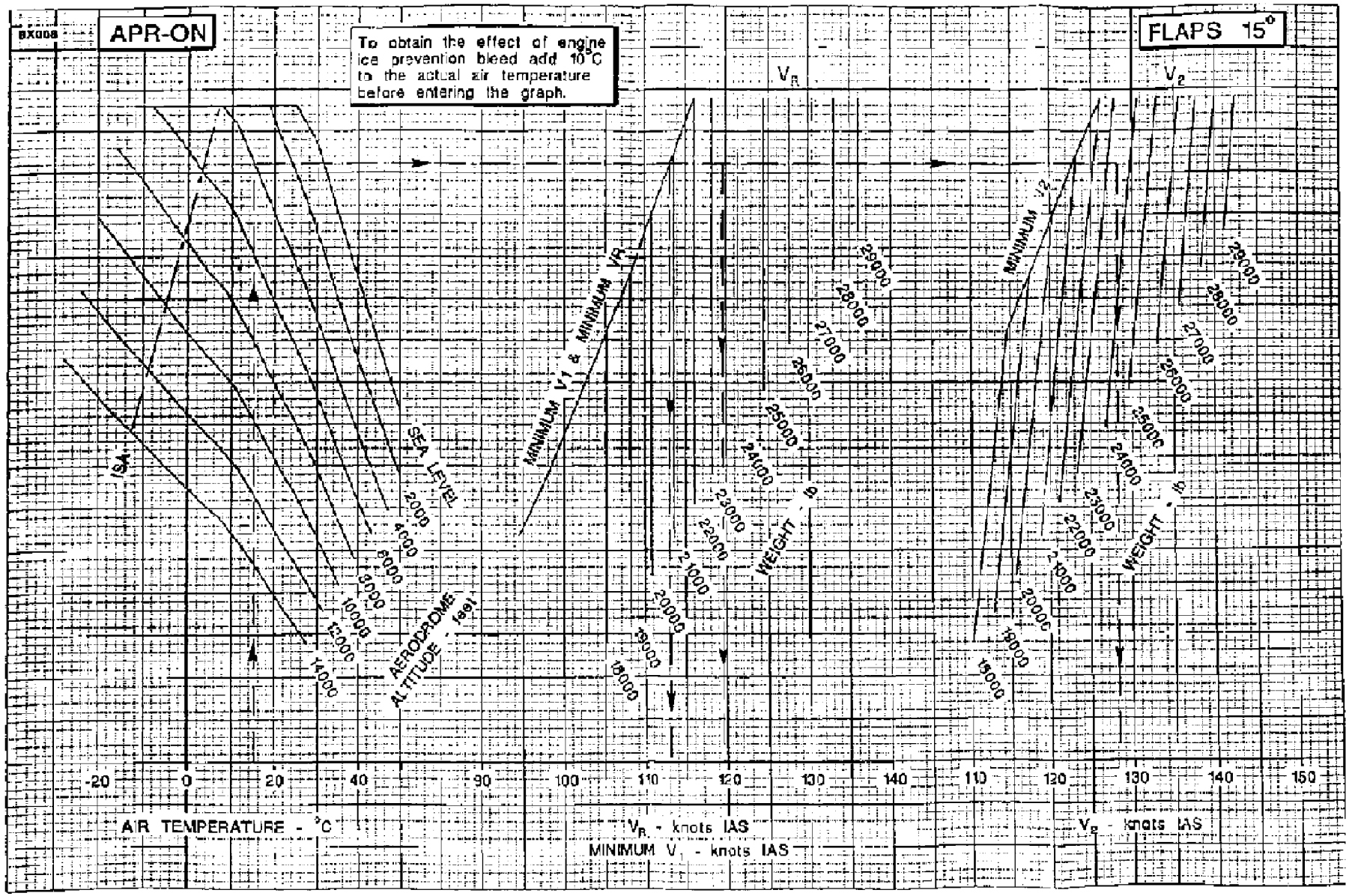


Figure PER-8. Takeoff Speeds—APR ON, FLAPS 15˚, and Weights in lb

FOR TRAINING PURPOSES ONLY

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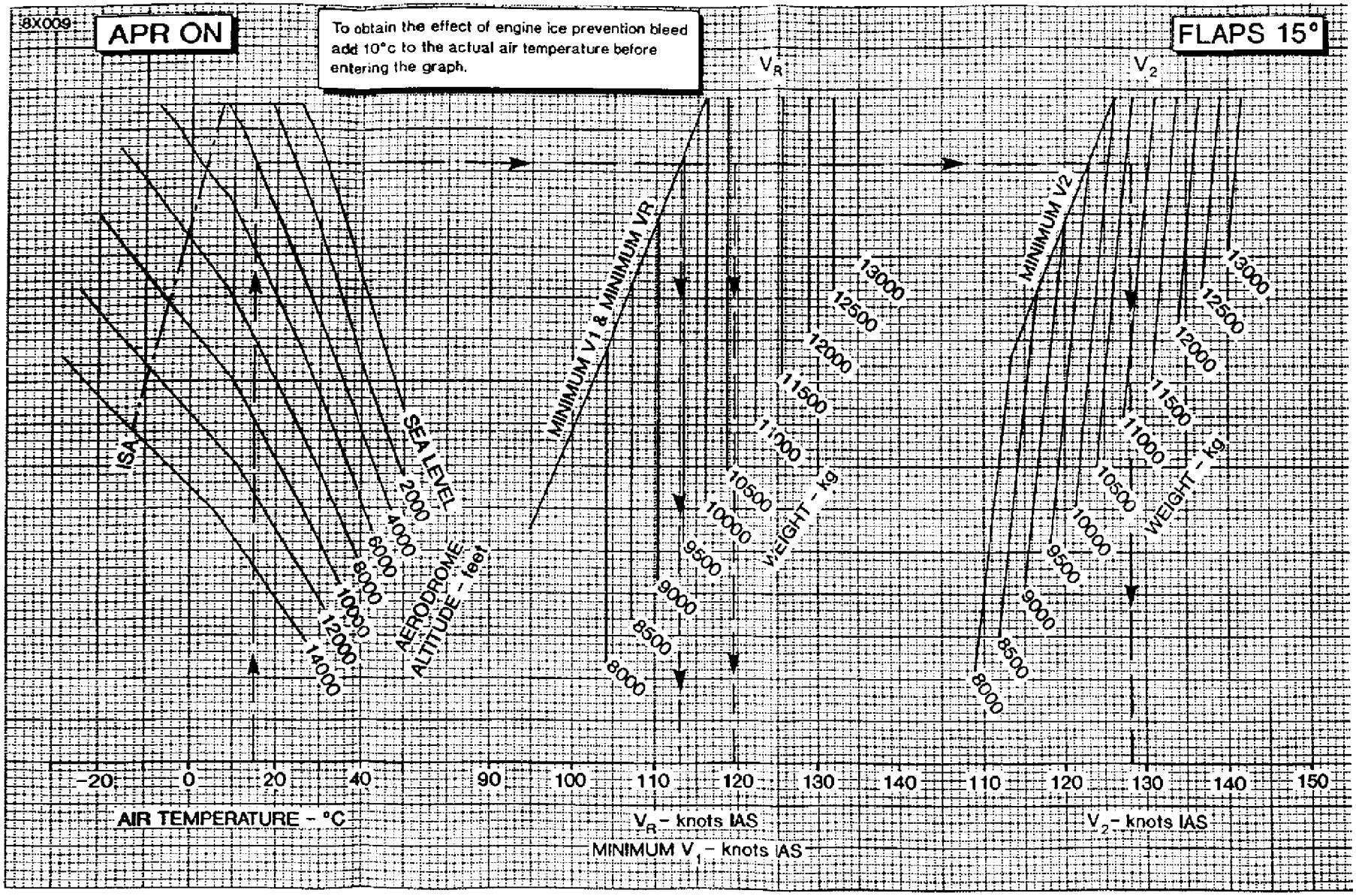


Figure PER-9. Takeoff Speeds—APR ON, Flaps 15° and Weights in kg

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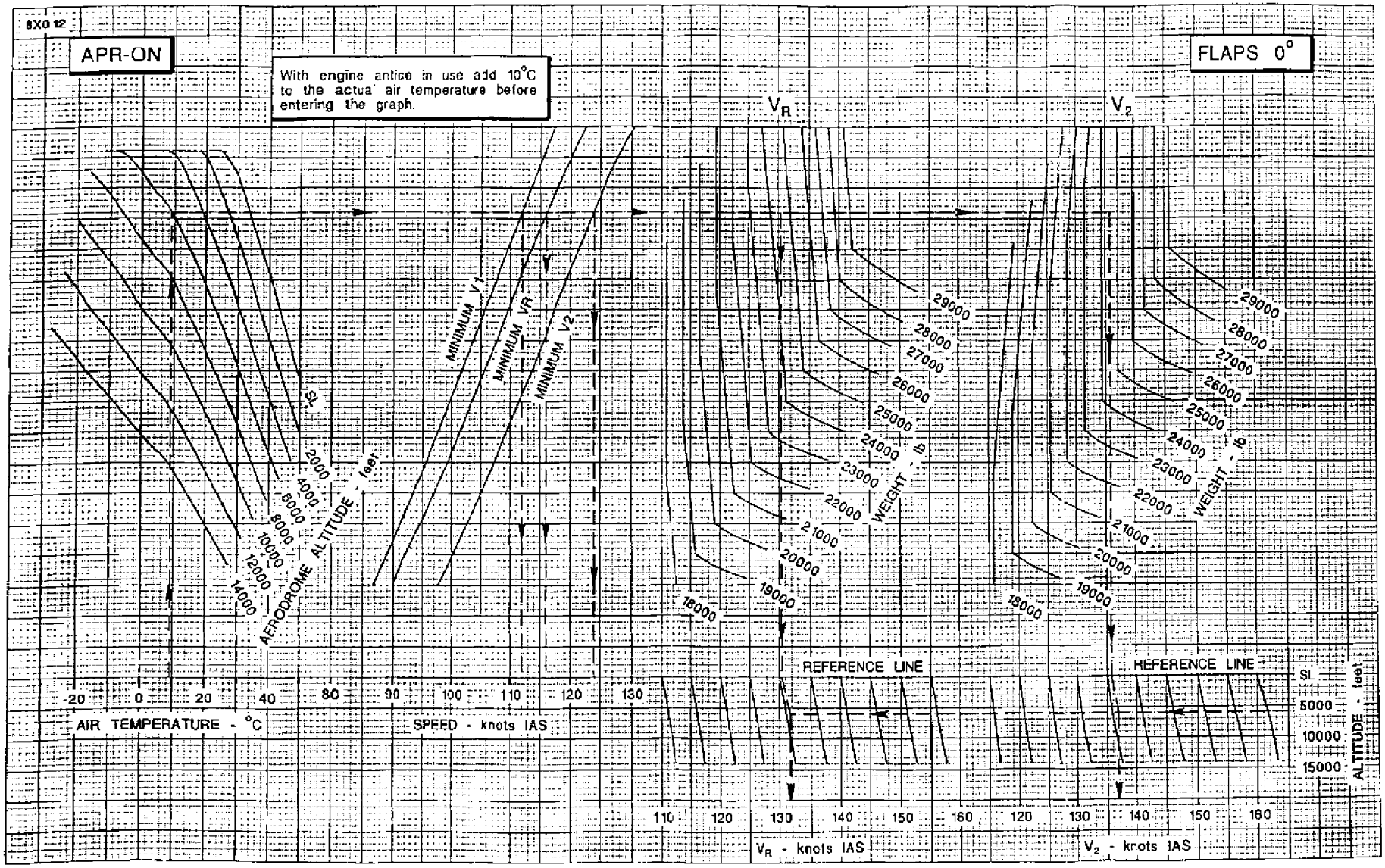


Figure PER-10. Takeoff Speeds—APR ON, Flaps 0° and Weight in lb

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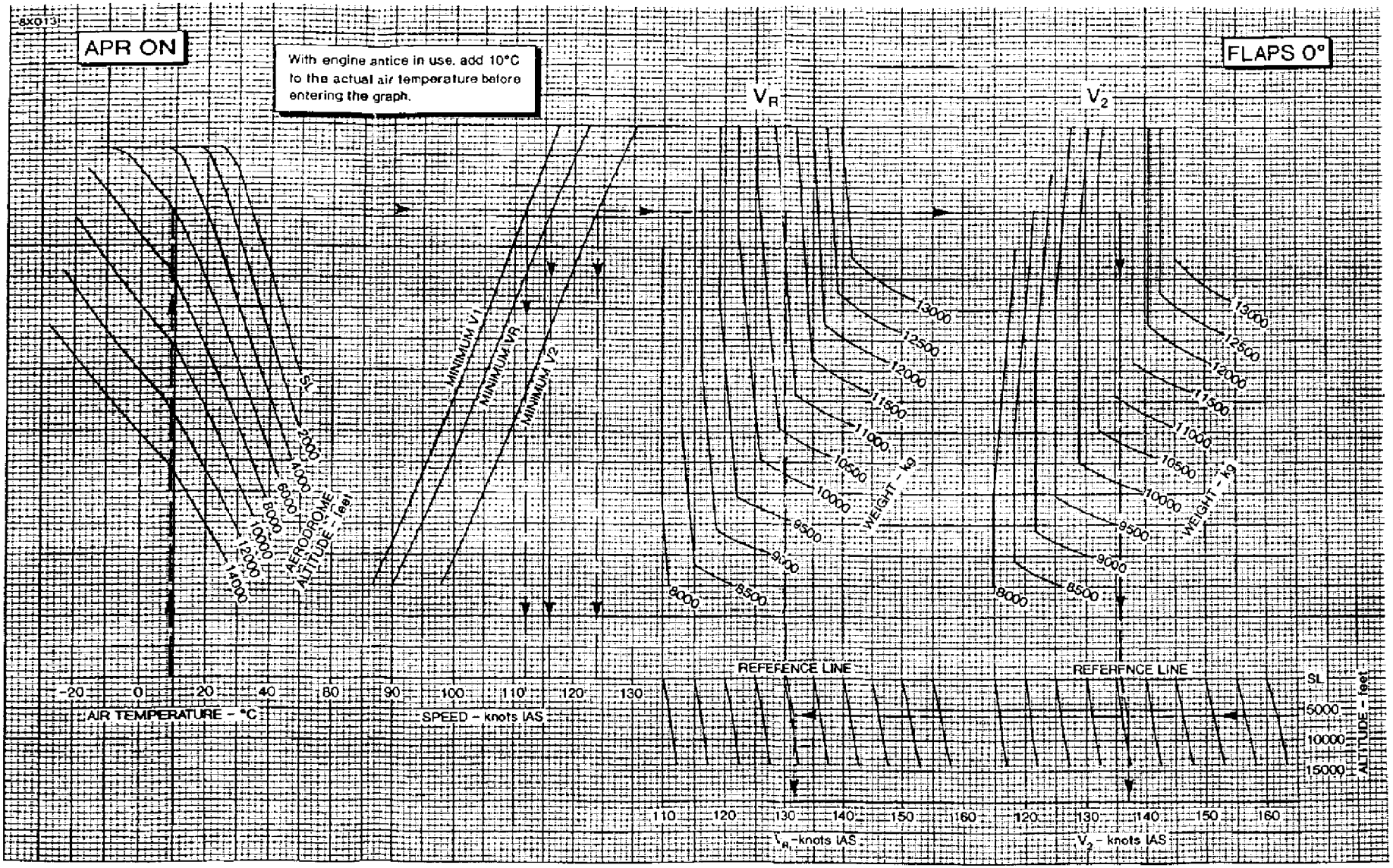


Figure PER-11. Takeoff Speeds—APR ON, Flaps 0˚ and Weight in kg

FOR TRAINING PURPOSES ONLY

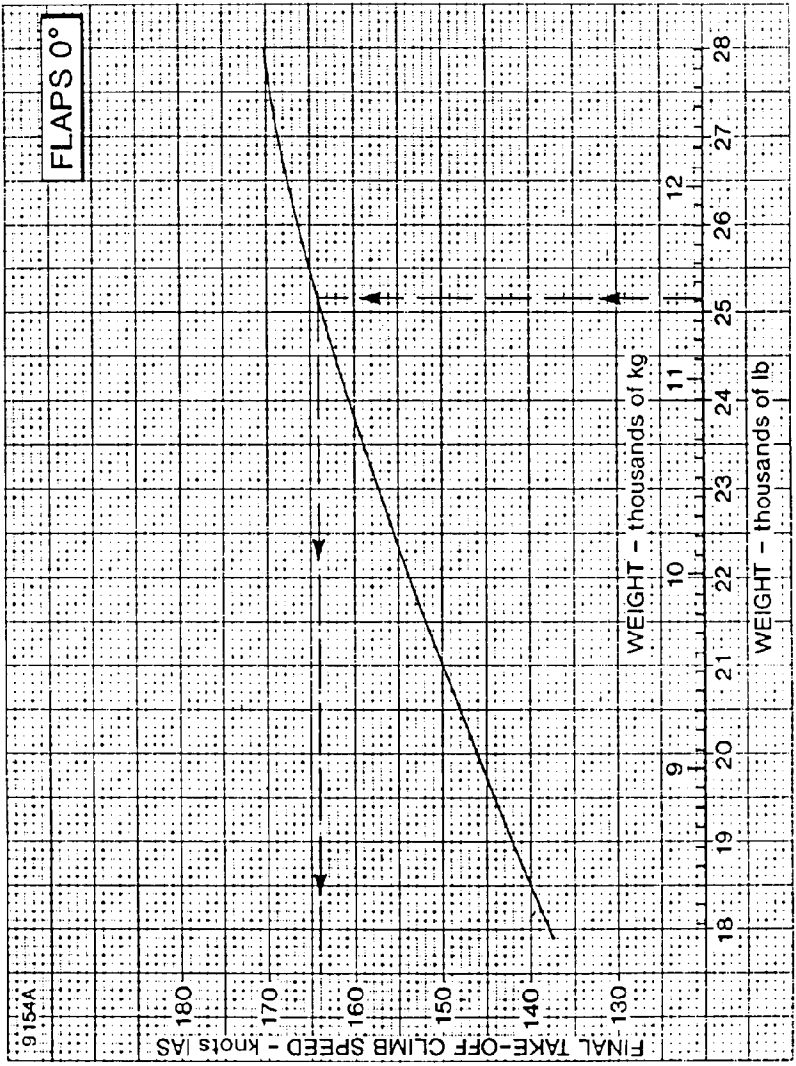


Figure PER-12. Final Takeoff Climb Speed

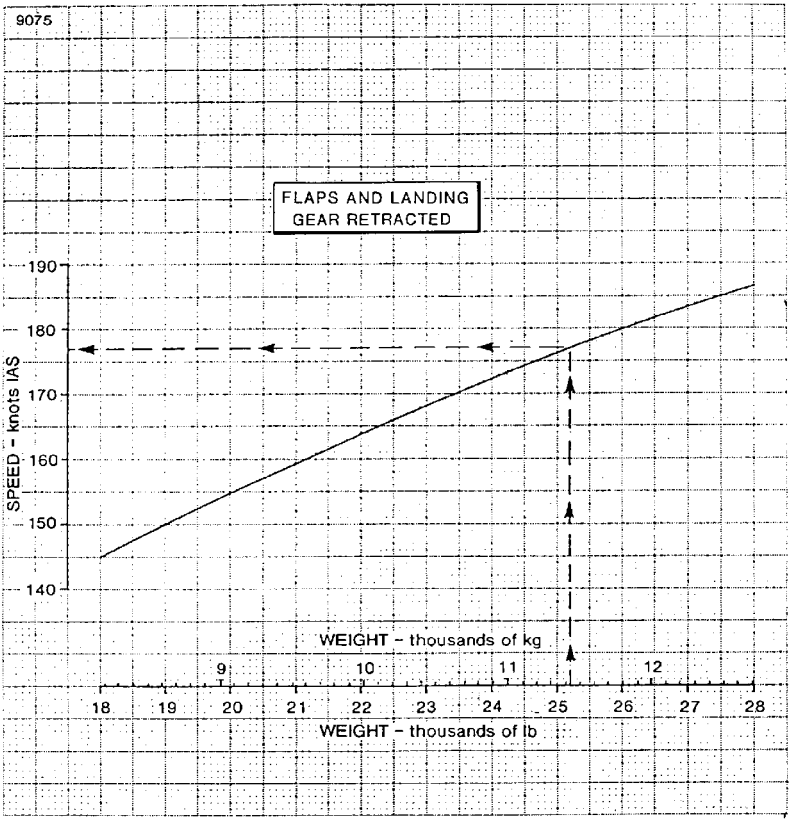


Figure PER-13. Enroute Climb Speed

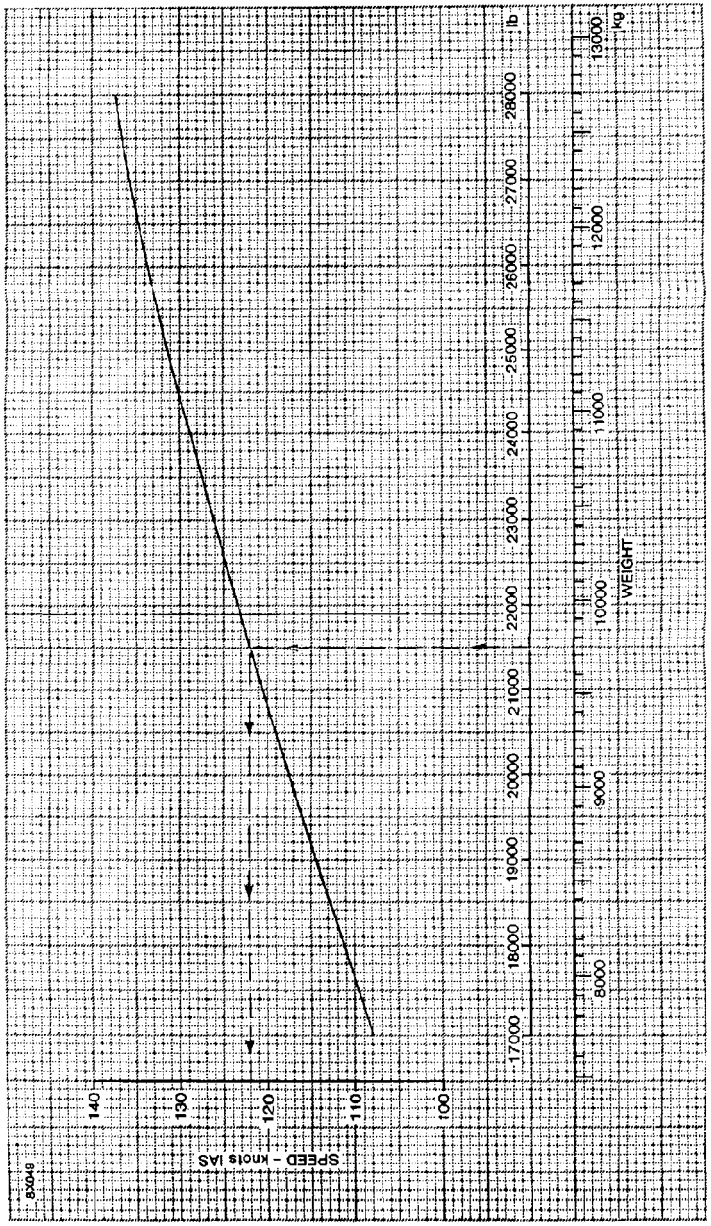


Figure PER-14. Landing Reference Speed V_{REF}

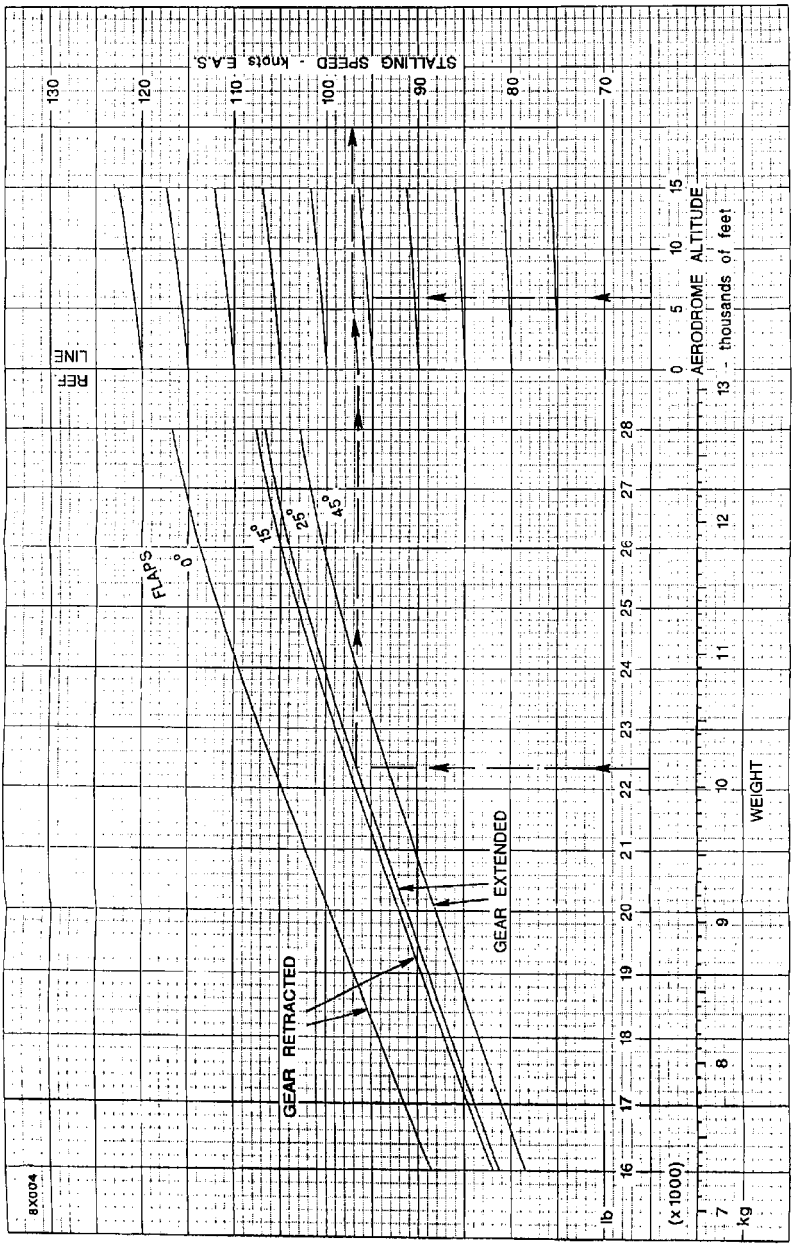


Figure PER-15. Power Off Stalling Speeds

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TAKEOFF WAT DATA

INTRODUCTION

This section contains weight, altitude and temperature (WAT) data which limit the takeoff weight of the aircraft from a consideration of airworthiness climb requirements and tire speed limitations. The climb performance upon which the curves are based is given in subsection 5.55 of the *AFM*.

INSTRUCTIONS FOR USE OF CHARTS

To Determine the WAT Limit Required

- Determine the appropriate takeoff WAT chart:
  - Figure PER-16 (*AFM* Figure 5.15.1) gives weight, altitude, and temperature limits with flaps 15°. Tire speed is never limiting with flaps 15°.
  - Figure PER-17 (*AFM* Figure 5.15.2) gives weight, altitude, and temperature limits with flaps 0° and nosewheel tires limited to 190 mph.
  - Figure PER-18 (*AFM* Figure 5.15.3) gives weight, altitude, and temperature limits flaps 0° and tires limited to 210 mph.
  - Enter the appropriate chart from the left with the aerodrome altitude. Move across to the air temperature.
  - From the intersection of the air temperature and aerodrome altitude, move down to read the maximum allowable takeoff weight from the bottom scale.

NOTE

- To obtain the effect of engine anti-ice on climb gradient, add 10° C to the actual air temperature before entering the chart.
- The maximum weight determined by other considerations such as available takeoff field length must also be checked (see Subsection 5.20 of the *AFM*).

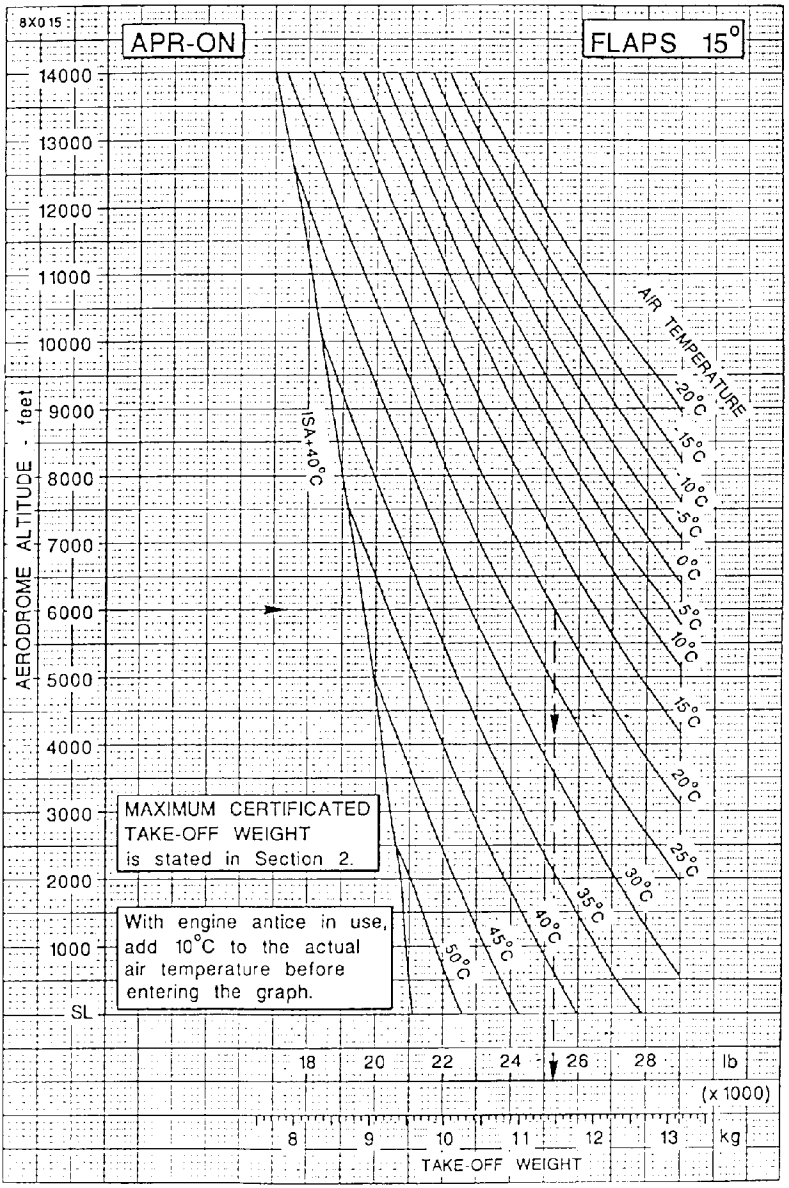


Figure PER-16. Maximum Takeoff Weight for Altitude and Temperature—Flaps

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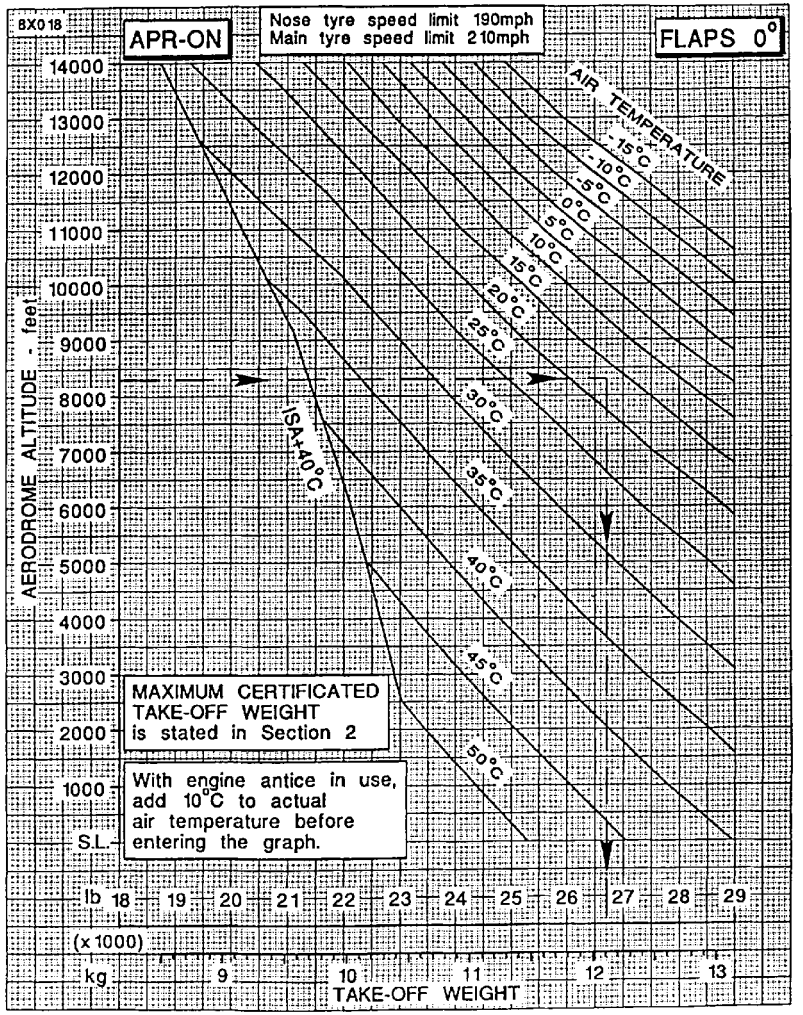


Figure PER-17. Maximum Takeoff Weight for Altitude and Temperature—Nose Tire Speed Limit 190 mph and Flaps 0˚

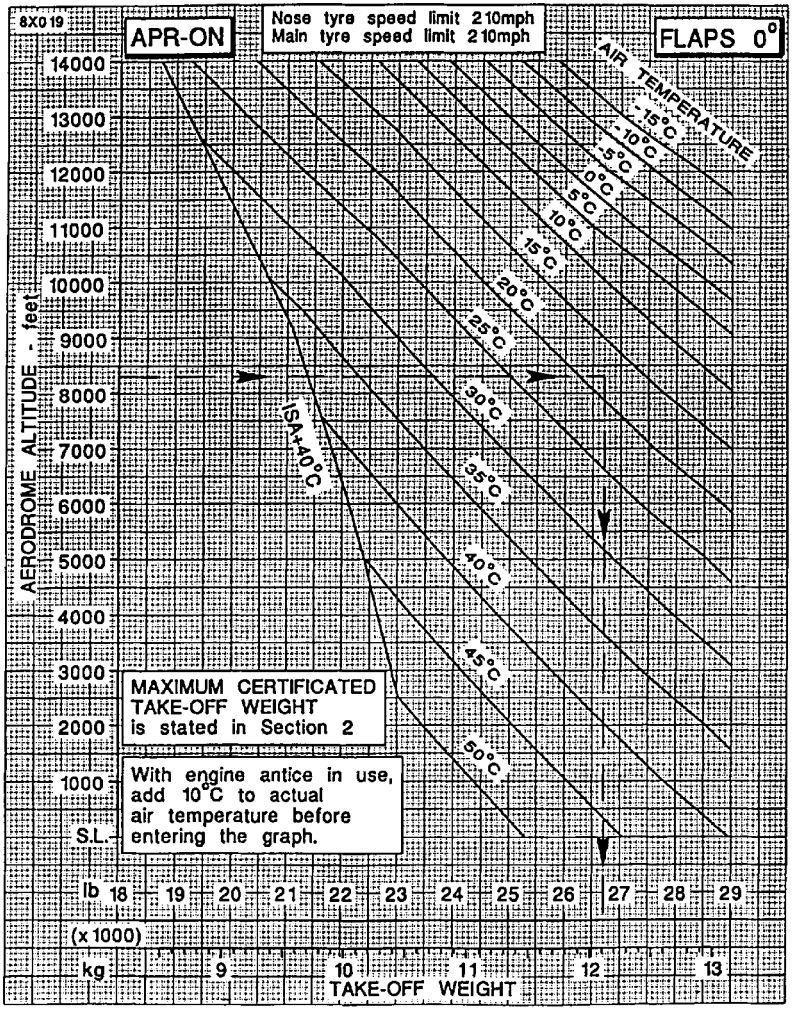


Figure PER-18. Maximum Takeoff Weight for Altitude and Temperature—Nose Tire Speed Limit 210 mph and Flaps 0˚

TAKEOFF FIELD LENGTH WITH APR ON

INTRODUCTION

The data given here enables the maximum permissible takeoff weight and the optimum value of V_1 to be calculated for the available field length. The effect of brake energy limitations can also be found.

Supplement 4 to the *AFM* contains tabulated information which, for a restricted range of conditions, will allow higher takeoff weights from a given runway length than those given here.

The maximum takeoff weight at a particular airfield may be further restricted by some other performance criteria, such as the WAT limit, the net takeoff flight path or enroute terrain clearance requirements. The actual takeoff weight may therefore have to be less than that permitted solely by consideration of the takeoff field length.

DEFINITIONS

Takeoff Distance Available—This is the length of the runway plus clearway. Takeoff distance available may be abbreviated to TODA in this section.

Takeoff Run Available—This is the length of the runway. Takeoff run available may be abbreviated to TORA in this section.

Accelerate-Stop Distance Available—This is the length of the runway plus stopway. Accelerate-stop distance available may be abbreviated to ASDA in this section.

Balance Field Length—A balanced field length is one in which TODA and ASDA are equal in length and TODA is not critical.

Clearway—A clearway is an area beyond the runway, not less than 500 feet wide, centered on the extended center line of the runway, and under the control of the airport authorities. The clearway is expressed in terms of a clearway plane, extending from the end of the runway with an upward slope not exceeding 1.25%, above which no object nor any portion of the terrain protrudes, except that threshold lights may protrude above the plane if their height above the end of the runway is not greater than 36 inches and if they are located to each side of the runway.

Stopway—A Stopway is an area beyond the runway, equal to or exceeding the width of the runway, centered on the center line of the runway, and designated by the airport authorities for use in decelerating the airplane during a rejected takeoff. To be considered as such, a stopway must be capable of supporting the airplane during a rejected takeoff without inducing structural damage to the airplane.

ASSOCIATED CONDITIONS

The performance is based on the assumptions in Table PER-7.

Table PER-7. TAKEOFF FIELD LENGTH ASSUMPTIONS

ENGINES	BOTH ENGINES ARE AT TAKEOFF THRUST WITH APR ARMED. FAILURE OF THE CRITICAL ENGINE OCCURS AT V_1.
ENGINE BLEED AIR	AIR CONDITIONING BLEED OFF; SEE NOTE 1 FOR THE EFFECT OF ENGINE ANTI-ICE BLEED.
FLAPS	TAKEOFF SETTING, EITHER 15° OR 0°; SEE NOTE 2.
LANDING GEAR	UP SELECTED AFTER LIFTOFF.
RUNWAY	HARD DRY RUNWAY.

NOTE:

1. TO TAKE ACCOUNT OF ENGINE ANTI-ICE ON THE TAKEOFF WEIGHT, ADD 10° C TO THE ACTUAL AIR TEMPERATURE BEFORE ENTERING THE CHARTS.
2. WHEN THE TAKEOFF IS TO MADE WITH A FLAP SETTING OF 15°, FIGURES PER-19 THROUGH PER-30 ARE APPLICABLE. WHEN TAKEOFF IS TO BE MADE WITH FLAPS 0°, FIGURES PER-31 THROUGH PER-48 ARE APPLICABLE.
3. THE WIND GRIDS ARE FACTORED IN SUCH A WAY THAT AN EFFECT OF NOT MORE THAN 50% OF HEADWINDS AND NOT LESS THAN 150% OF TAILWINDS IS OBTAINED. REPORTED WINDS MAY THEREFORE BE USED DIRECTLY IN THE WIND GRIDS. WHEN A TAKEOFF IS TO BE MADE INTO A HEADWIND EXCEEDING 40 KNOTS, THE CHARTS ARE TO BE READ AT 40 KNOTS.

The techniques in Table PER-8 have been assumed.

Table PER-8. TAKEOFF FIELD LENGTH TECHNIQUES

NORMAL TAKEOFF	BOTH ENGINES ARE RUN UP TO NORMAL TAKEOFF THRUST WITH APR ARMED, AND THEN THE BRAKES ARE RELEASED. ROTATION IS INITIATED AT V_R.
ENGINE FAILURE REJECTED TAKEOFF	FAILURE OF ONE ENGINE IS RECOGNIZED AT V_1. BOTH THRUST LEVERS ARE CLOSED, MAXIMUM WHEEL BRAKING USING ANTI-SKID IS APPLIED, AIRBRAKES ARE OPENED AND THE AIRCRAFT BROUGHT TO A STOP.
	NOTE: NO REDUCTION IN STOPING DISTANCE IS CREDITED FOR THE USE OF REVERSE THRUST.
ENGINE FAILURE CONTINUED TAKEOFF	FOLLOWING THE FAILURE OF ONE ENGINE AT V_1, MAXIMUM THRUST IS AUTOMATICALLY SET ON THE OPERATING ENGINE. ROTATION IS INITIATED AT V_R; CLIMB AWAY IS MADE TO ACHIEVE V_2 APPROPRIATE TO THE FLAP SETTING AT 35 FEET. LANDING GEAR IS SELECTED UP THREE SECONDS AFTER LIFTOFF.

Rolling Start Takeoffs

Where rolling start takeoffs are used, reduce all available field lengths (TORA, TODA, ASDA) by 100 feet when establishing takeoff weight based on field length.

Instructions for Use of Charts

- Enter Figure PER-19 (AFM Figure 5.20.2) (Flaps 15°) or PER-31 (*AFM* Figure 5.20.6) (Flaps 0°) on the left-hand side with the TAKEOFF DISTANCE AVAILABLE and proceed to the reference line of the RUNWAY SLOPE —%.

- Follow the guidelines to the appropriate gradient and continue similarly through the wind correction grid.

- Enter again with the ACCELERATE-STOP DISTANCE AVAILABLE at the bottom of the figure and proceed upwards through the gradient and wind grids to meet the line obtained from the takeoff distance available.

- At the point where the two lines cross, read the value of D and V_1/V_R. D is the equivalent balanced field length, zero wind and gradient, which would allow the same takeoff weight as the actual distances available. The value of V_1/V_R is the optimum value for these distances (i.e., that which allows the highest takeoff weight).

- If the intersection point falls among the horizontal lines on the right of the grid, V_1 is equal to V_R.

- If takeoff run available is less than takeoff distance available, enter Figure PER-20 (*AFM* Figure 5.20.3) (Flaps 15°) or PER-32 (*AFM* Figure 5.20.7) (Flaps 0°) with takeoff run on the left-hand side and obtain D and V_1/V_R as before. If the takeoff run is not less than takeoff distance, this step is not necessary.

- Enter Figures PER-21 (*AFM* Figure 5.20.4) (Flaps 15°) or PER-33 (*AFM* Figure 5.20.8) (Flaps 0°) to obtain D values based on the takeoff distance and takeoff run with all engines operating.

- The lowest value of the four values of D obtained is the critical value which must be used to determine the takeoff weight.

Figures PER-22 through PER-30 (*AFM* Figures 5.20.5a–k) (Flaps 15°) and PER-34 through PER-48 (*AFM* Figures 5.20.9a–s) (Flaps 0°) present weight versus temperature and altitude for a range of values of D at 500-foot intervals.

- Select the closest value above (D_A) and below (D_B) the critical value D.

- Using the corresponding D_A and D_B values, enter the two charts at the bottom with air temperature. Move up to the aerodrome altitude and then proceed horizontally to read weights W_A (for D_A) and W_B (for D_B) from the scales at the right.

- Determine the weight for the critical value of D by interpolation between W_A and W_B using the following formula:

$$W = W_B + \left[\left(\frac{D - D_B}{500}\right) X \left(W_A - W_B\right)\right]$$

WHERE D IS THE CRITICAL VALUE OF D

- The value of V_1/V_R to be used is that obtained from the chart which gave the lowest value of D. If the lowest value of D came from Figure PER-21 or PER-33, then use V_1/V_R from the chart which gave the lowest value of D which did have an associated value of V_1/V_R.

- Having obtained V_R form Figure PER-8 or PER-10, use Figure PER-49 (*AFM* Figure 5.20.11) to determine V_1.

- Provided that the V_1 speed is not less than the minimum V_1 and that the maximum brake energy limit has not been exceeded, then the takeoff weight determined will be the maximum takeoff weight for the field length available, and the V_1 speed is the optimum value.

- If the V_1 speed determined above is less than the minimum V_1, then reduce takeoff distance available by an arbitrary amount (say 500 feet) and repeat the takeoff calculation until a value of V_1 is obtained which is not less than the minimum.

- The accelerate-stop distance appropriate to the maximum emergency brake energy capacity is shown on Figure PER-50. If the accelerate-stop distance used to determine takeoff weight was longer than this maximum, then the brake capacity would be exceeded and the maximum takeoff weight should be determined as described in Example 2.

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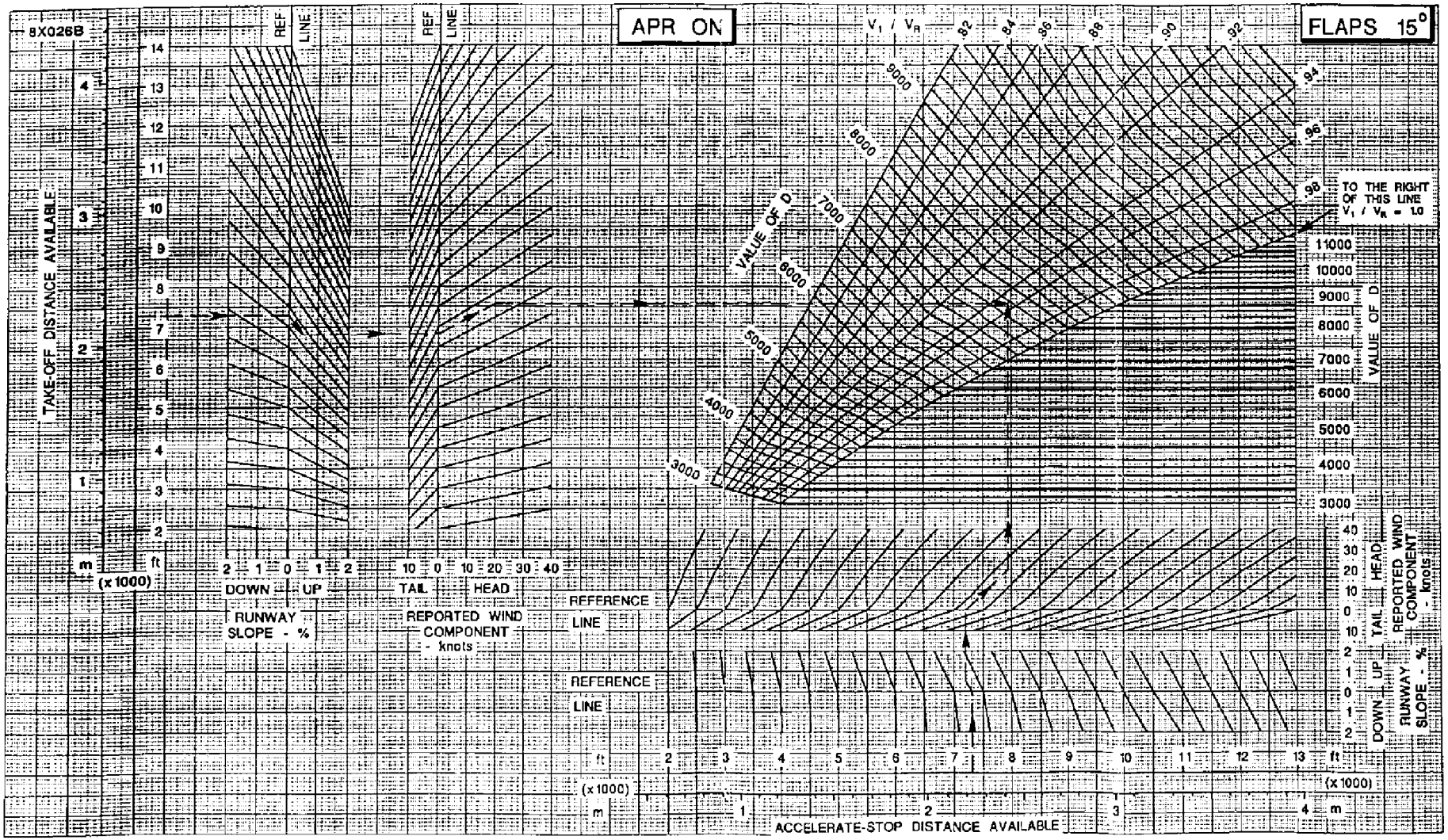


Figure PER-19. Value of D and V_1/V_R —Takeoff Distance and Acceleration Stop-Distance Available (Flaps 15˚)

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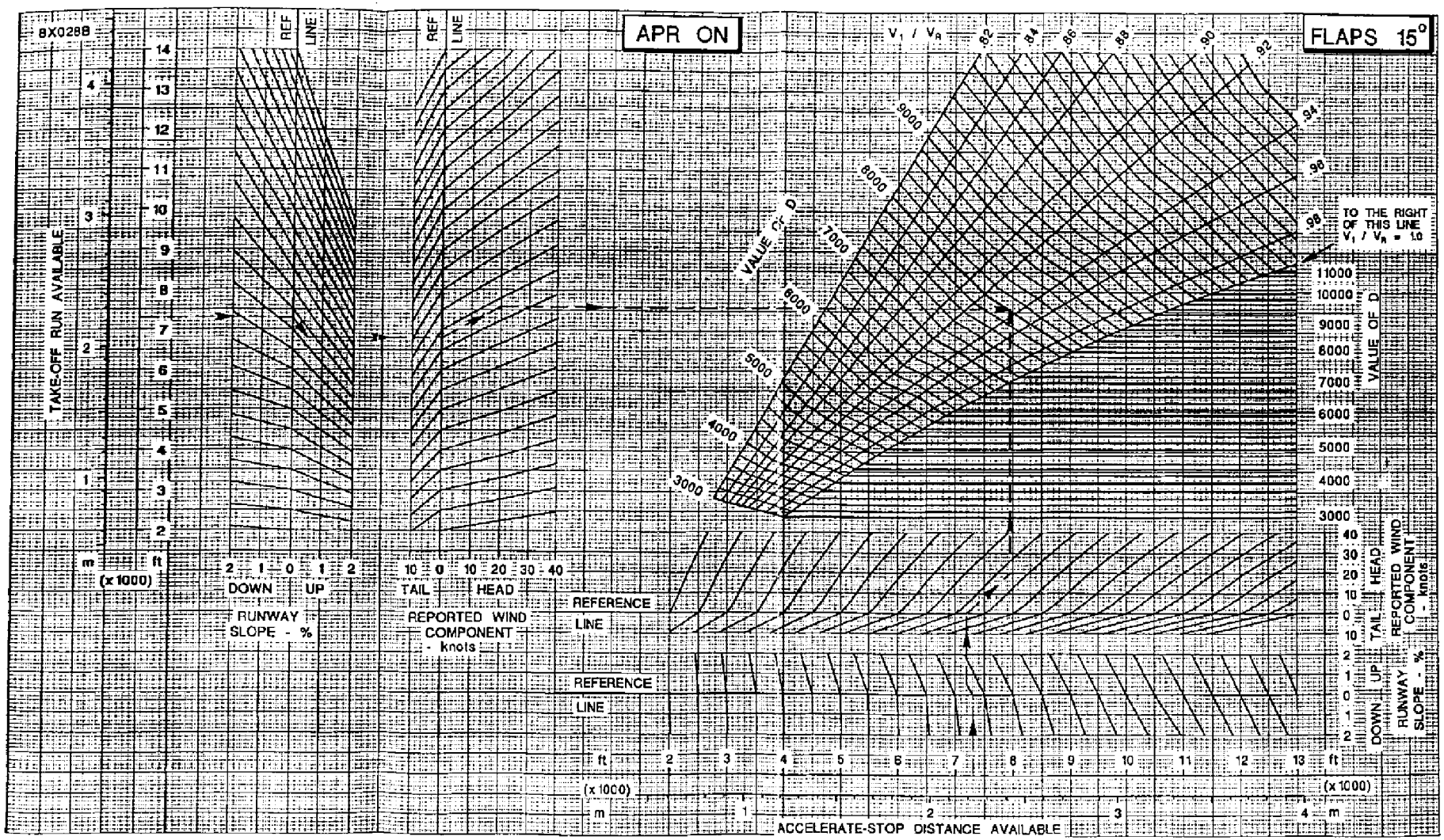


Figure PER-20. Value of D and V_1/V_R —Takeoff Run and Acceleration Stop-Distance Available (Flaps 15°)

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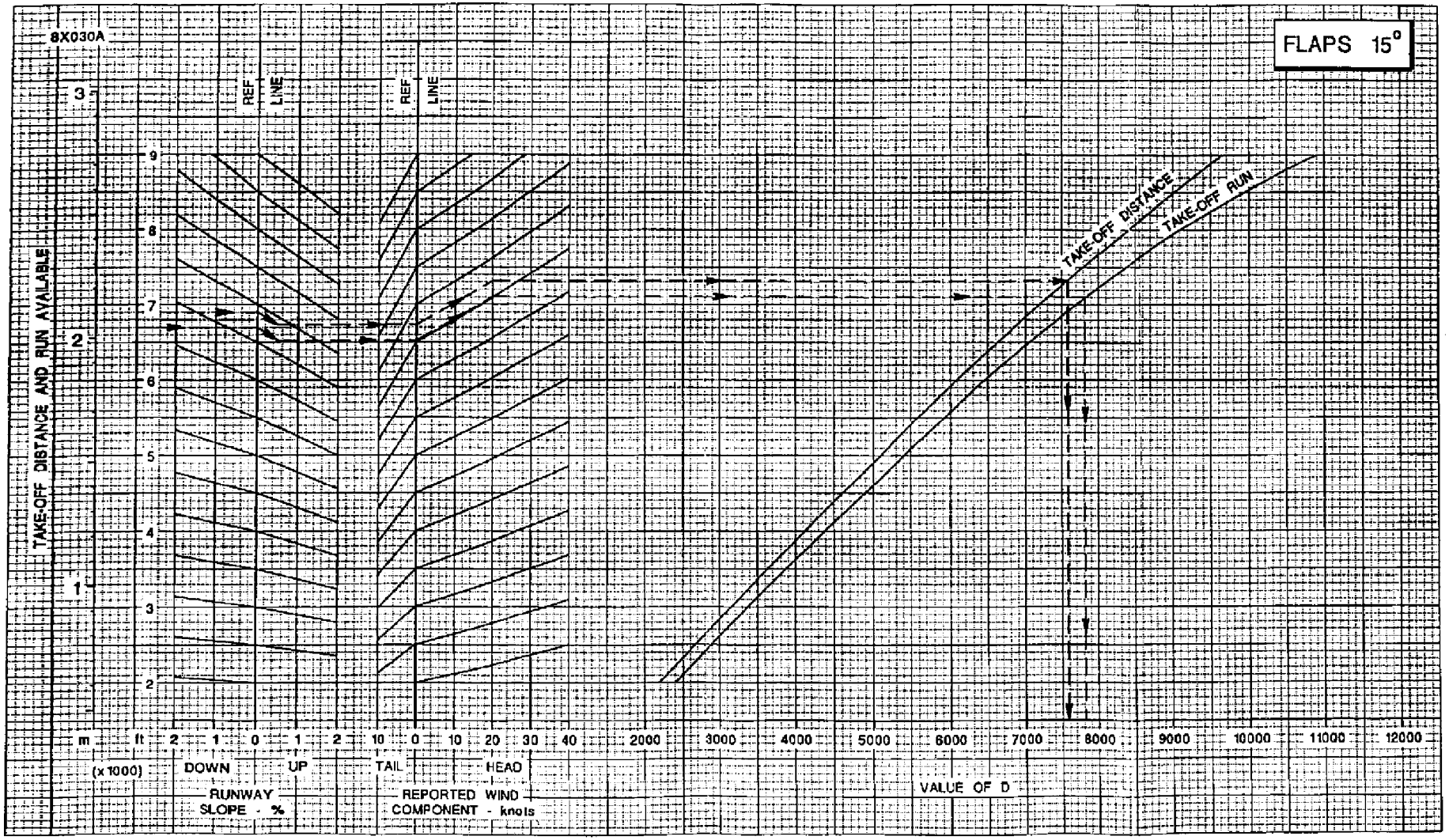


Figure PER-21. Value of D for Takeoff Distance and Takeoff Run Available (Flaps 15˚)

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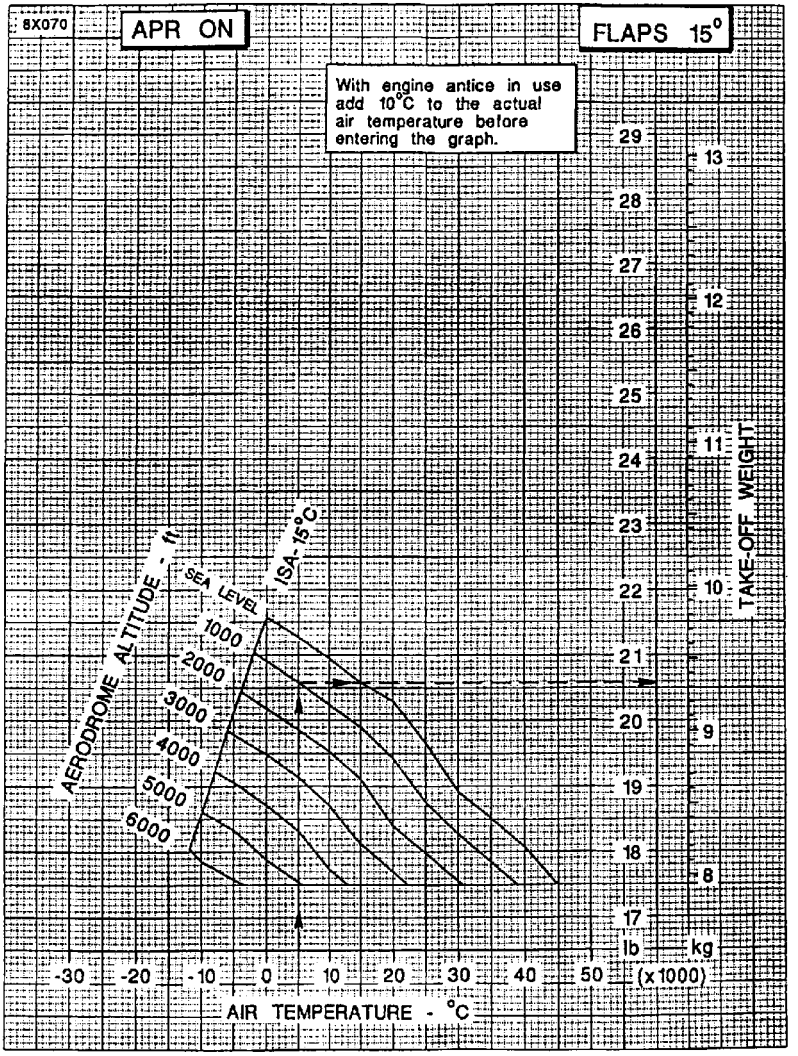


Figure PER-22. Takeoff Weight for D Equals 3,000 Feet (Flaps 15°)

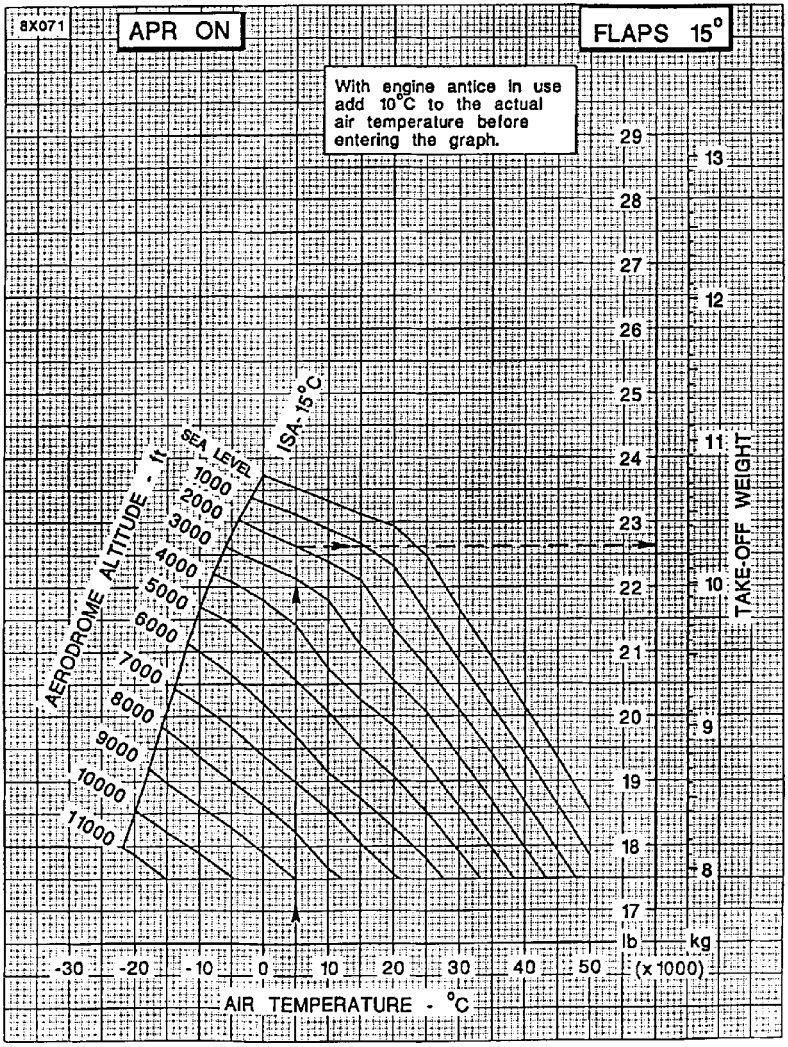


Figure PER-23. Takeoff Weight for D Equals 3,500 Feet (Flaps 15°)

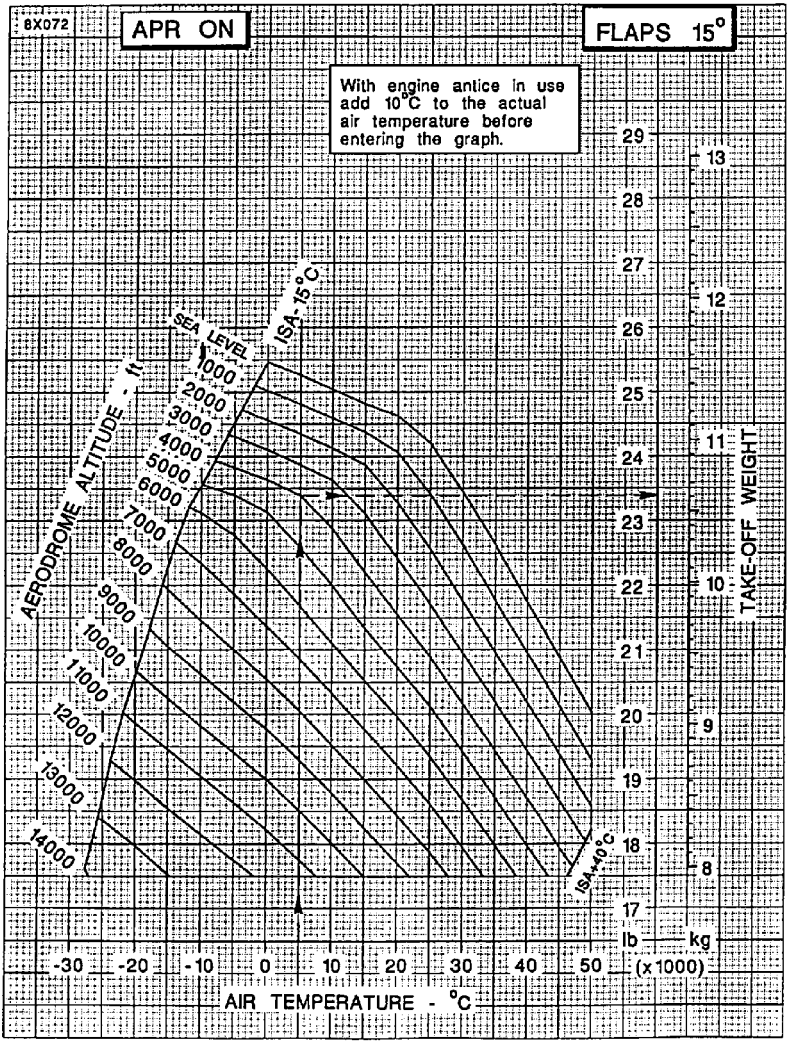


Figure PER-24. Takeoff Weight for D Equals 4,000 Feet (Flaps 15°)

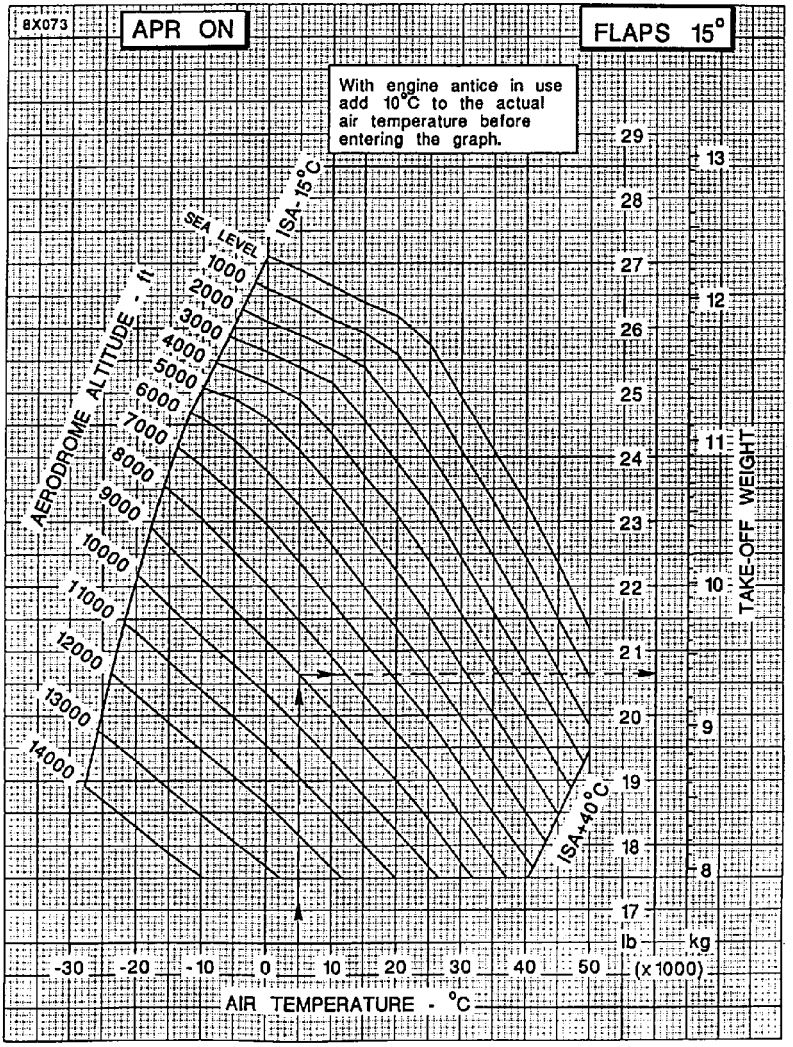


Figure PER-25. Takeoff Weight for D Equals 4,500 Feet (Flaps 15˚)

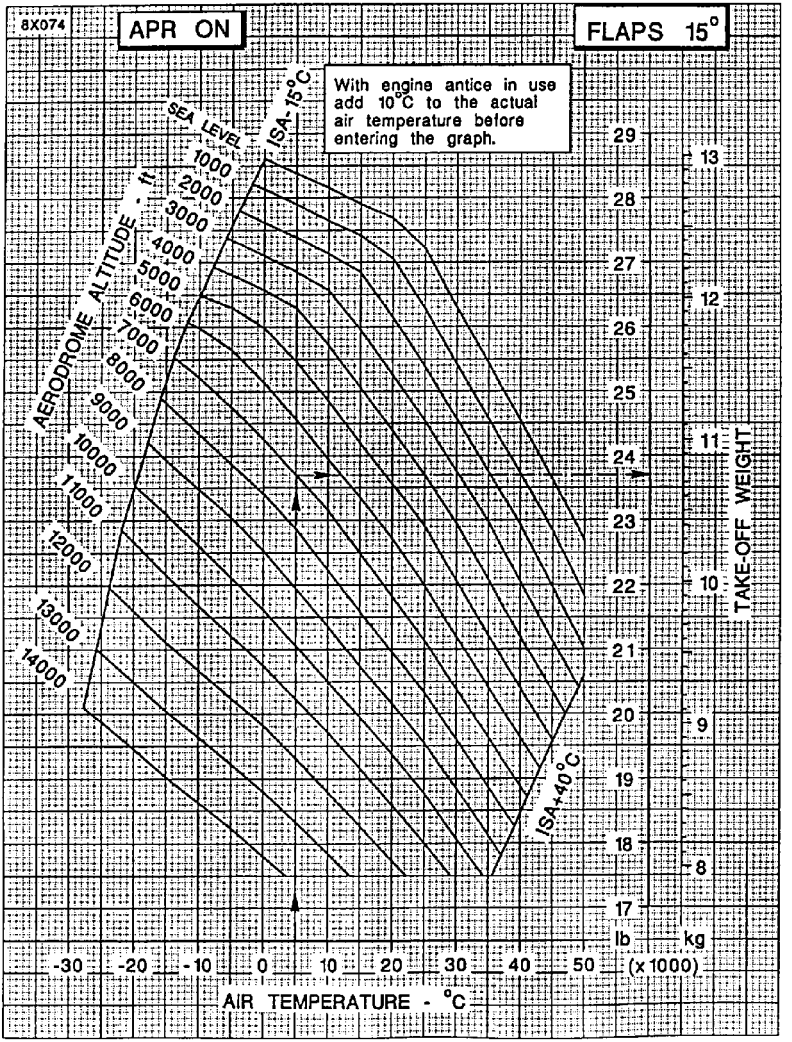


Figure PER-26. Takeoff Weight for D Equals 5,000 Feet (Flaps 15˚)

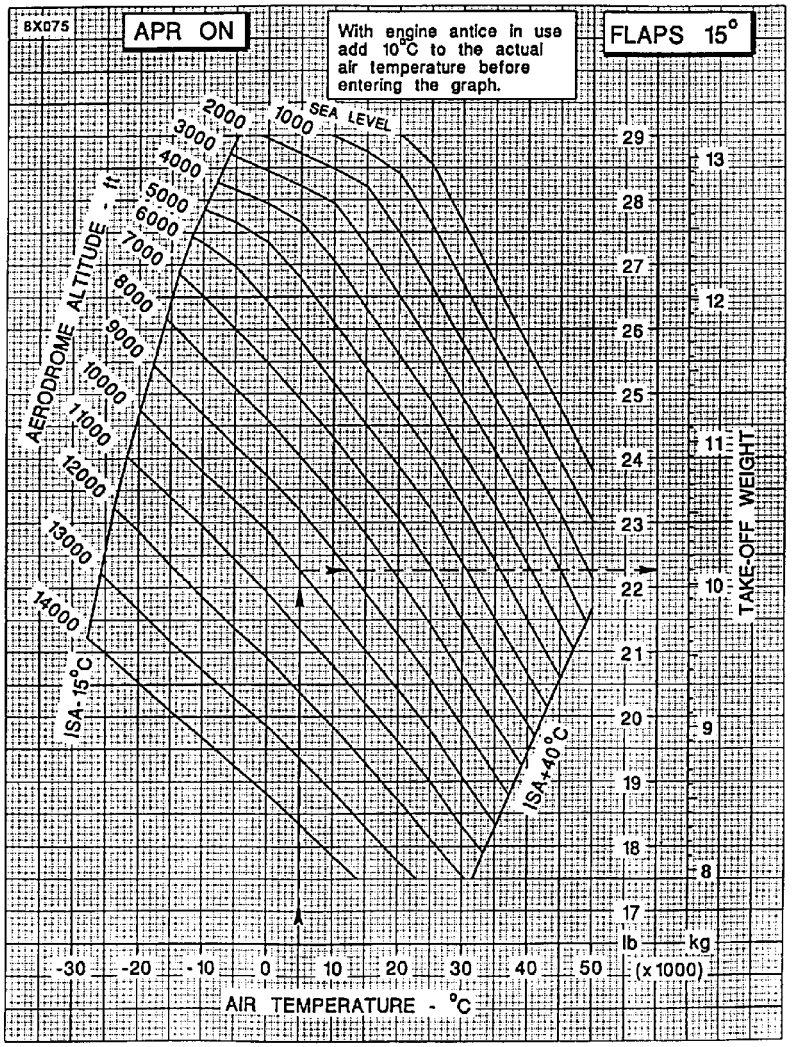


Figure PER-27. Takeoff Weight for D Equals 5,500 Feet (Flaps 15˚)

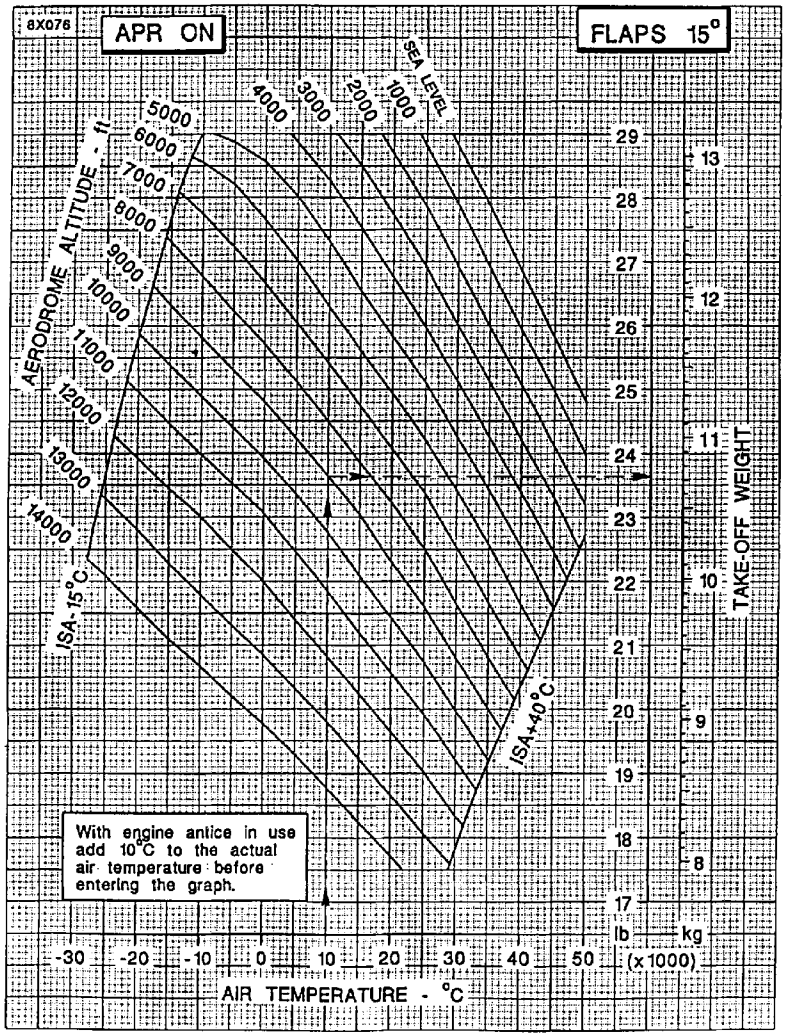


Figure PER-28. Takeoff Weight for D Equals 6,000 Feet (Flaps 15°)

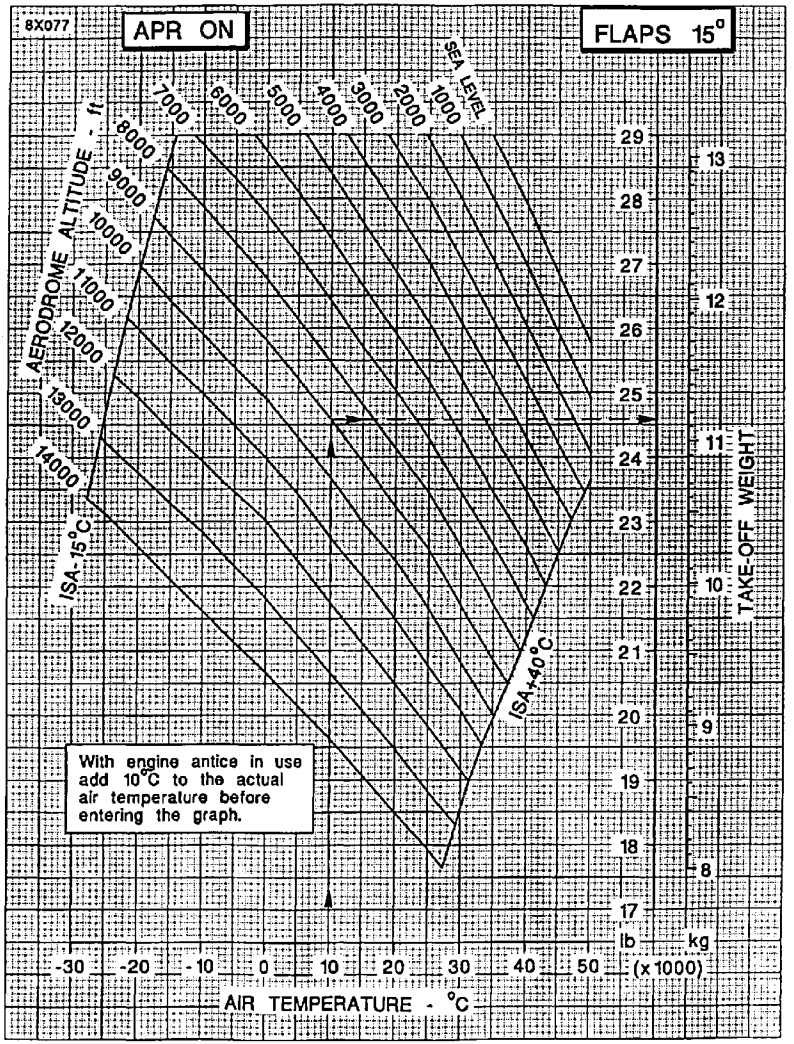


Figure PER-29. Takeoff Weight for D Equals 6,500 Feet (Flaps 15˚)

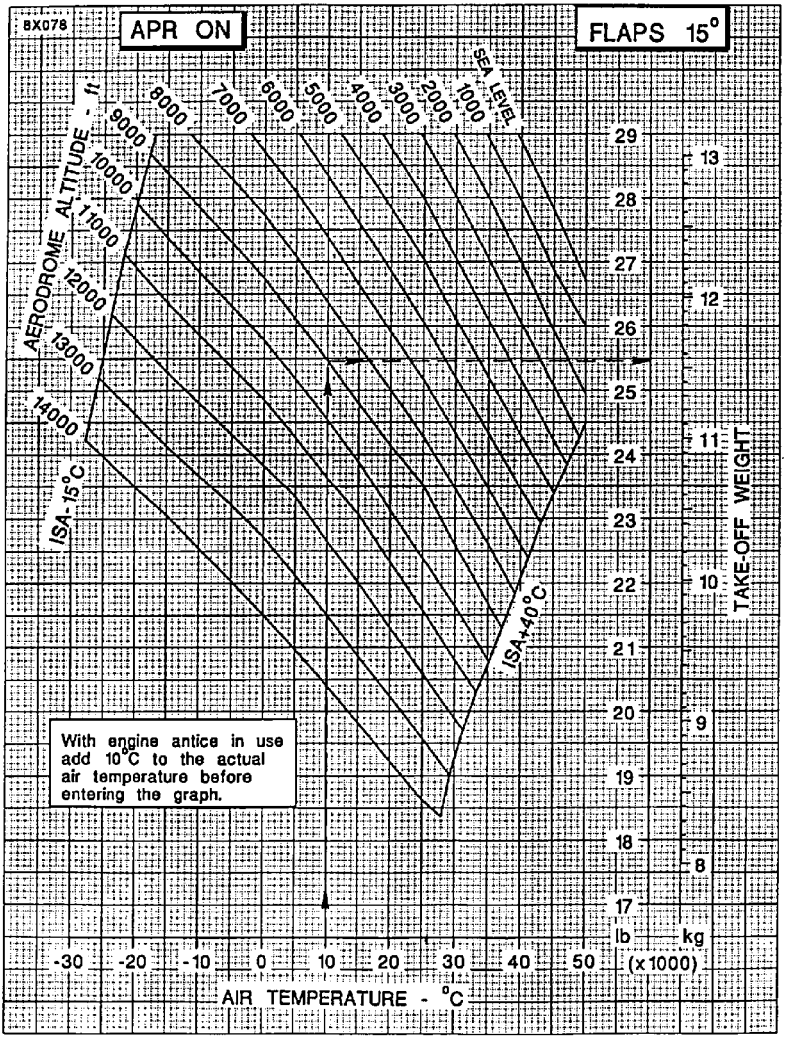


Figure PER-30. Takeoff Weight for D Equals 7,000 Feet (Flaps 15˚)

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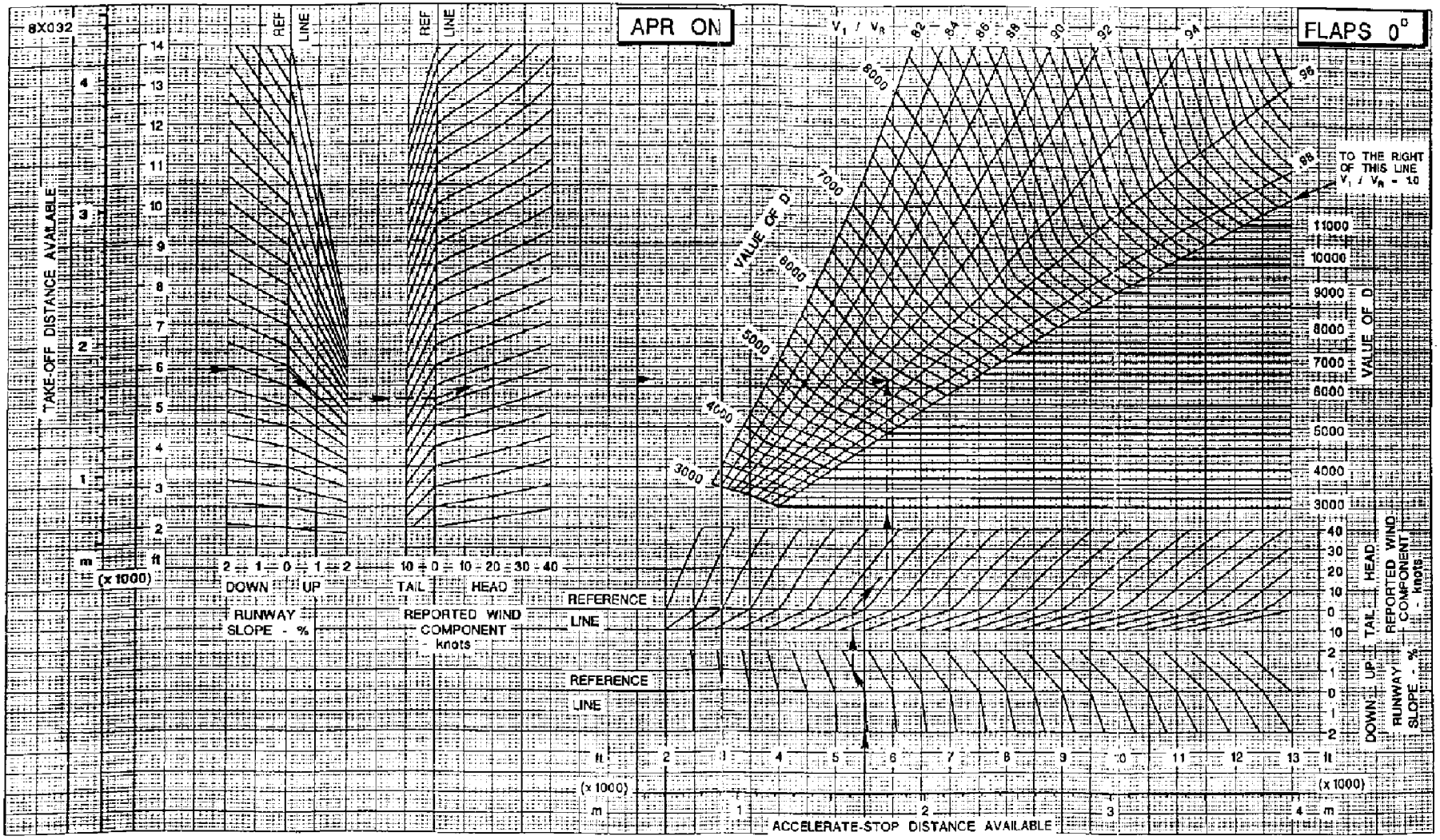


Figure PER-31. Value of D and V_1/V_R—Takeoff Distance and Accelerate-Stop Distance Available (Flaps 0°)

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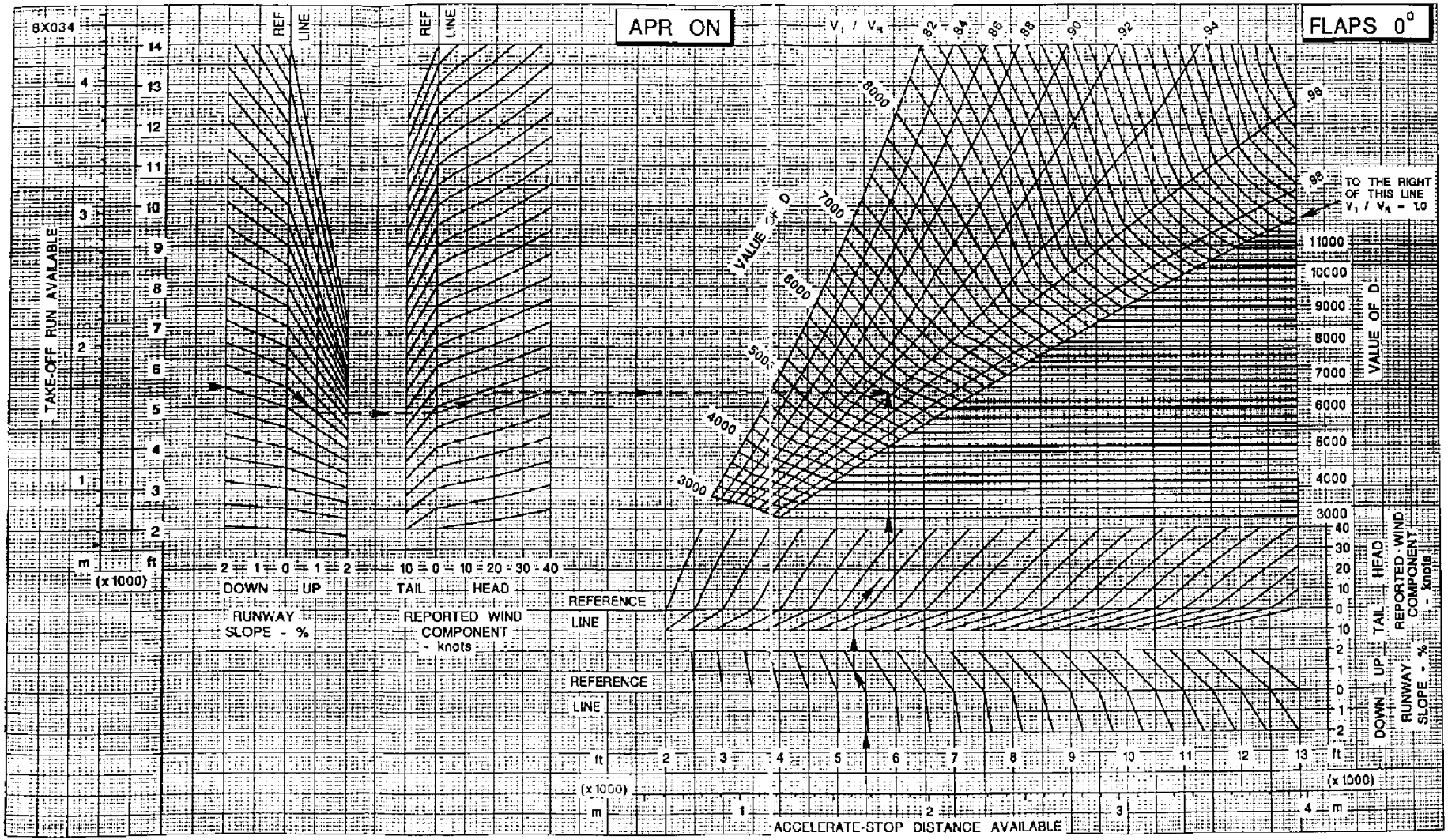


Figure PER-32. Value of D and V_1/V_R—Takeoff Run and Accelerate-Stop Distance Available (Flaps 0°)

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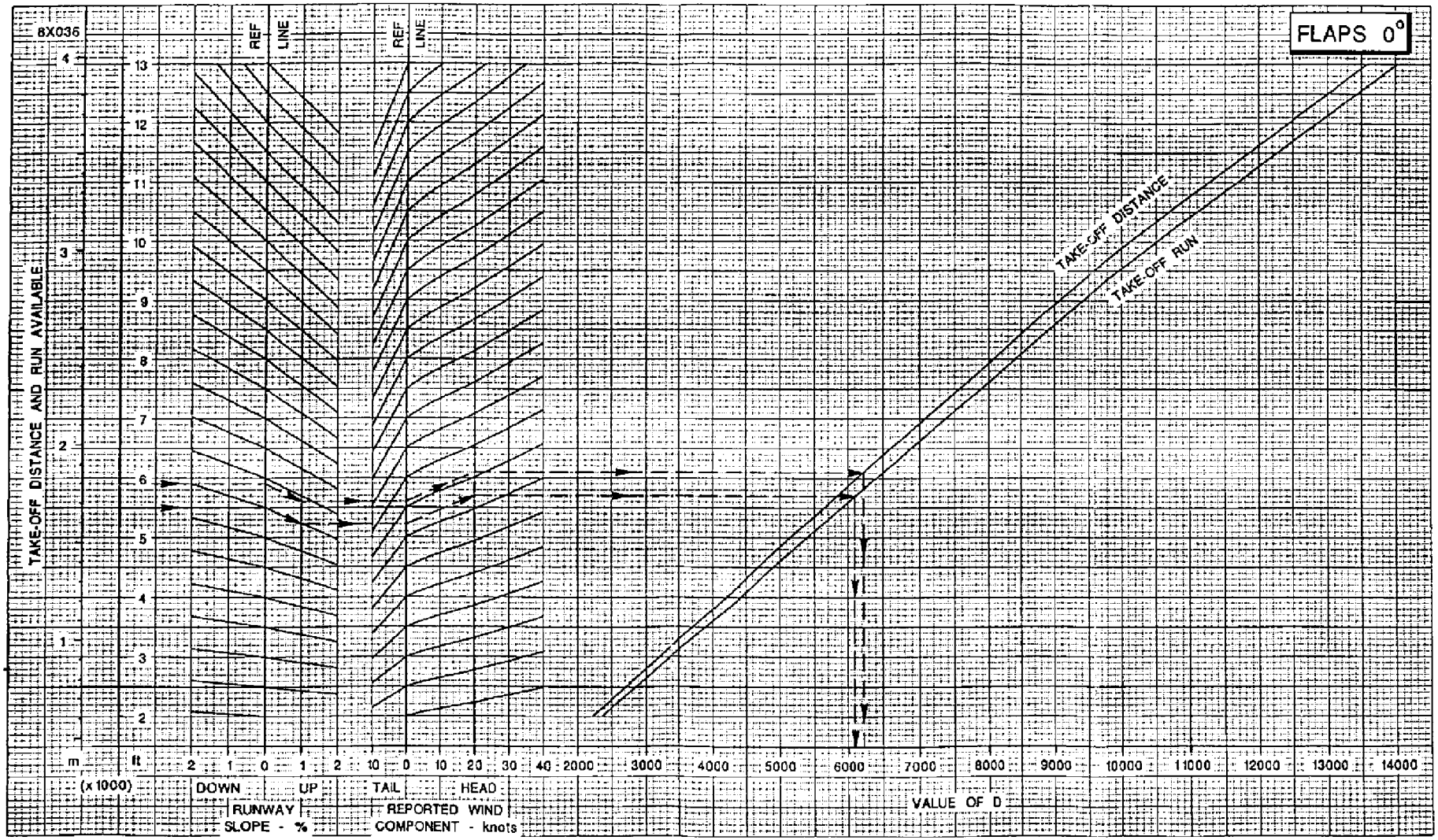


Figure PER-33. Value of D for Takeoff Distance and Takeoff Run Available (Flaps 0˚)

FOR TRAINING PURPOSES ONLY

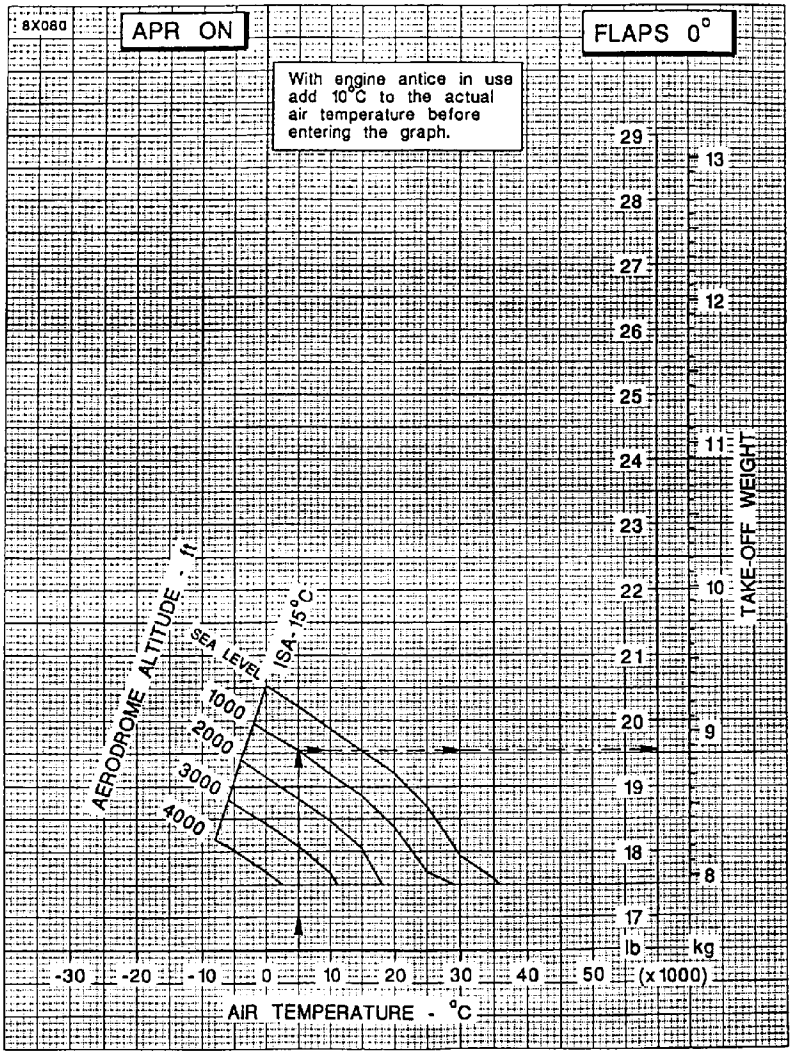


Figure PER-34. Takeoff Weight for D Equals 3,000 Feet (Flaps 0°)

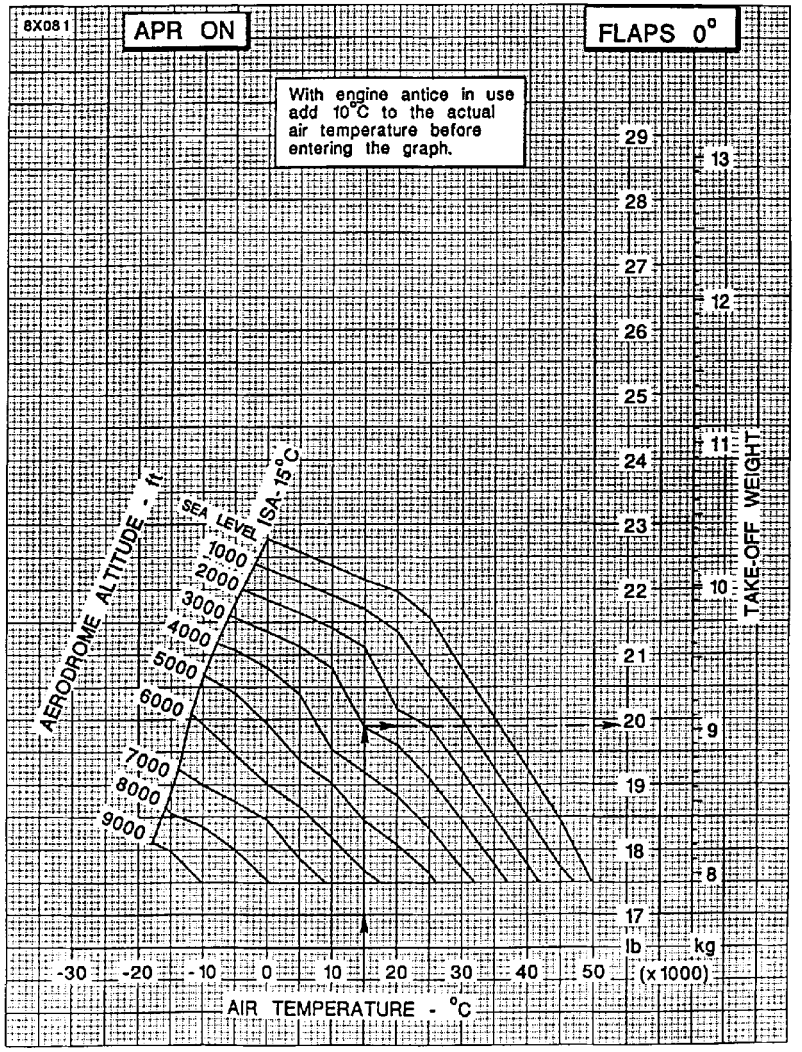


Figure PER-35. Takeoff Weight for D Equals 3,500 Feet (Flaps 0°)

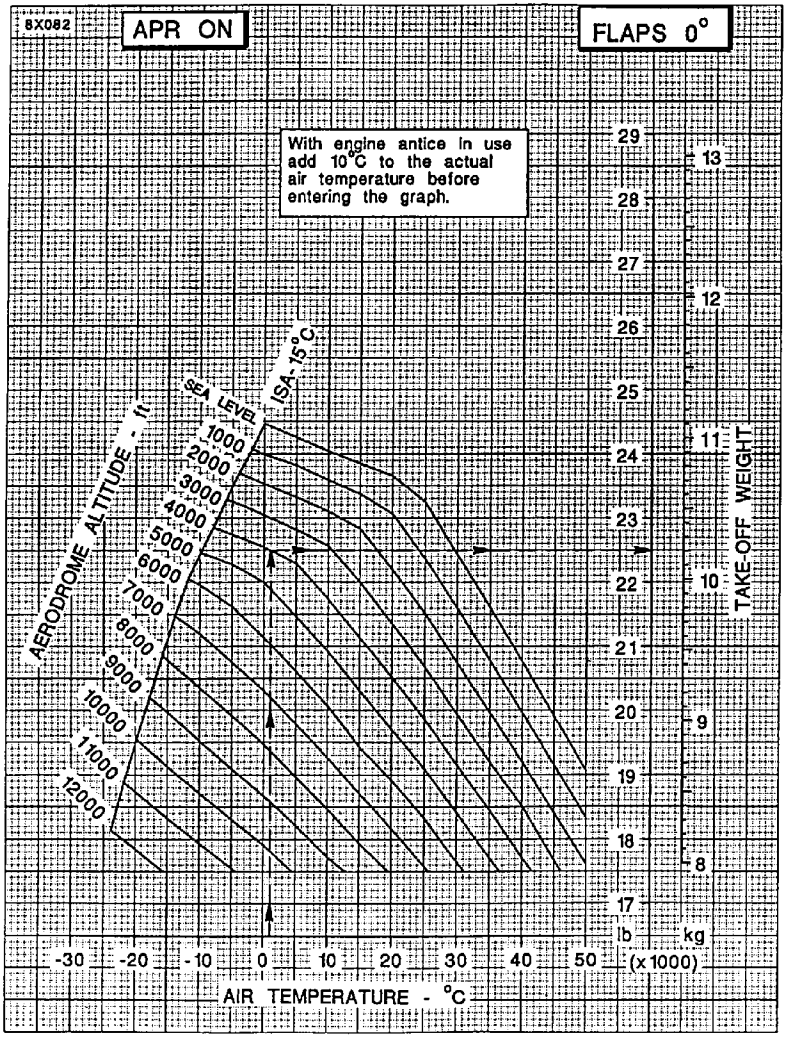


Figure PER-36. Takeoff Weight for D Equals 4,000 Feet (Flaps 0°)

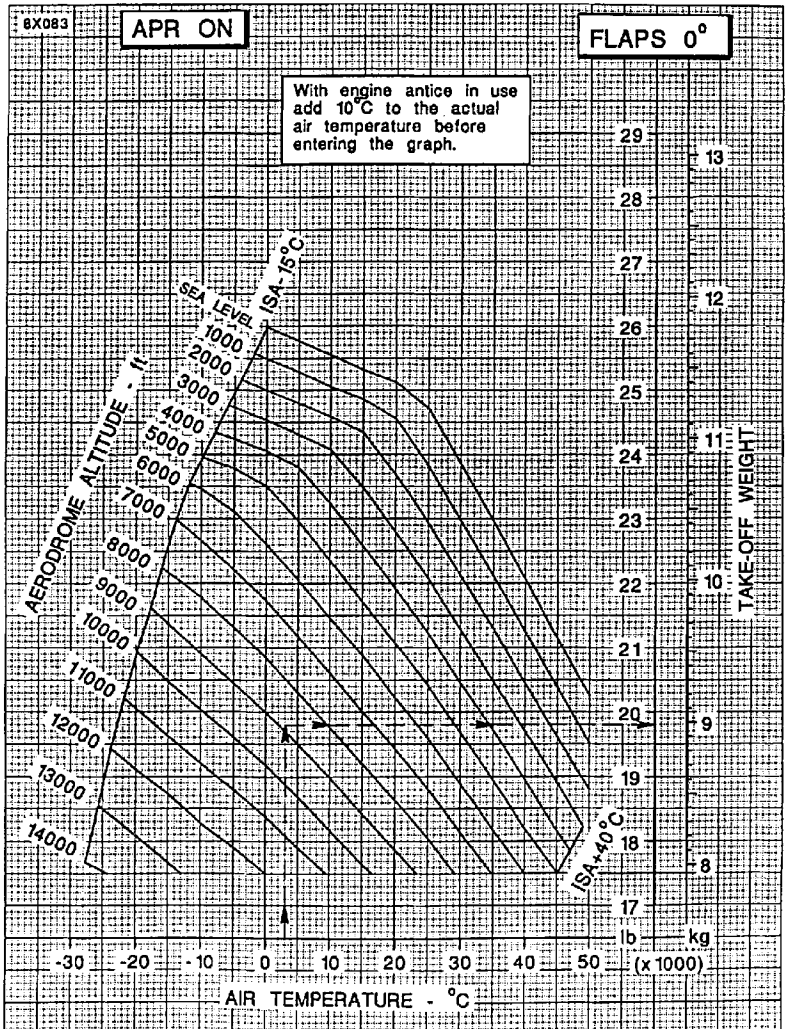


Figure PER-37. Takeoff Weight for D Equals 4,500 Feet (Flaps 0˚)

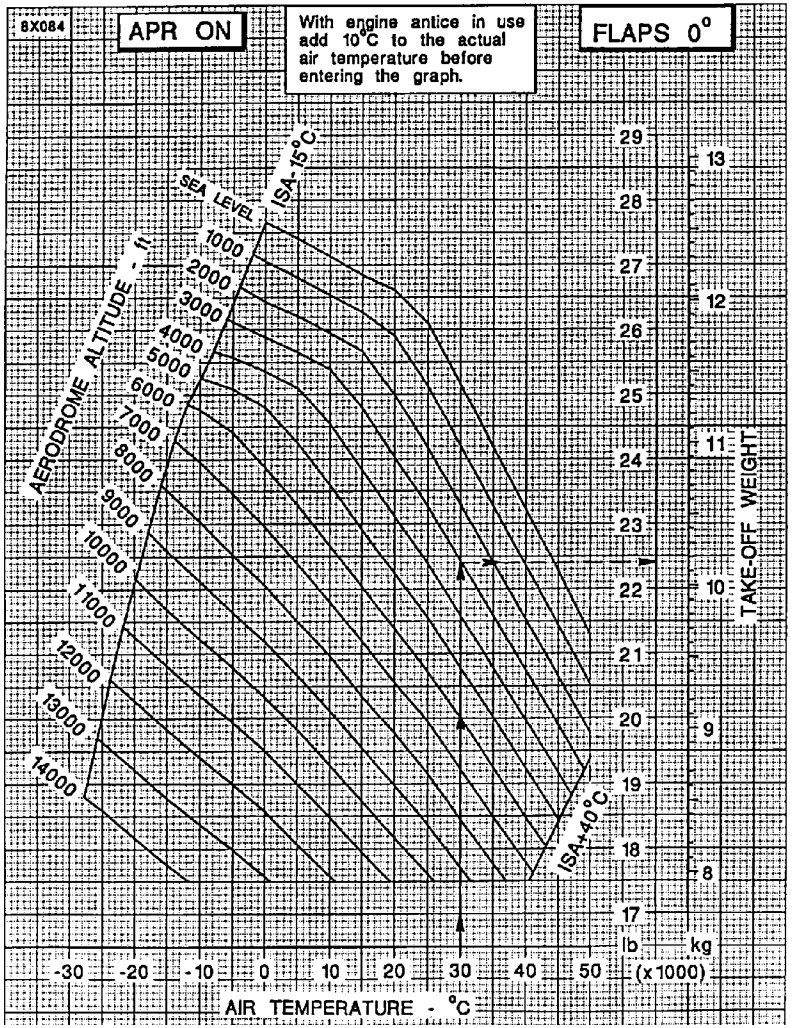


Figure PER-38. Takeoff Weight for D Equals 5,000 Feet (Flaps 0˚)

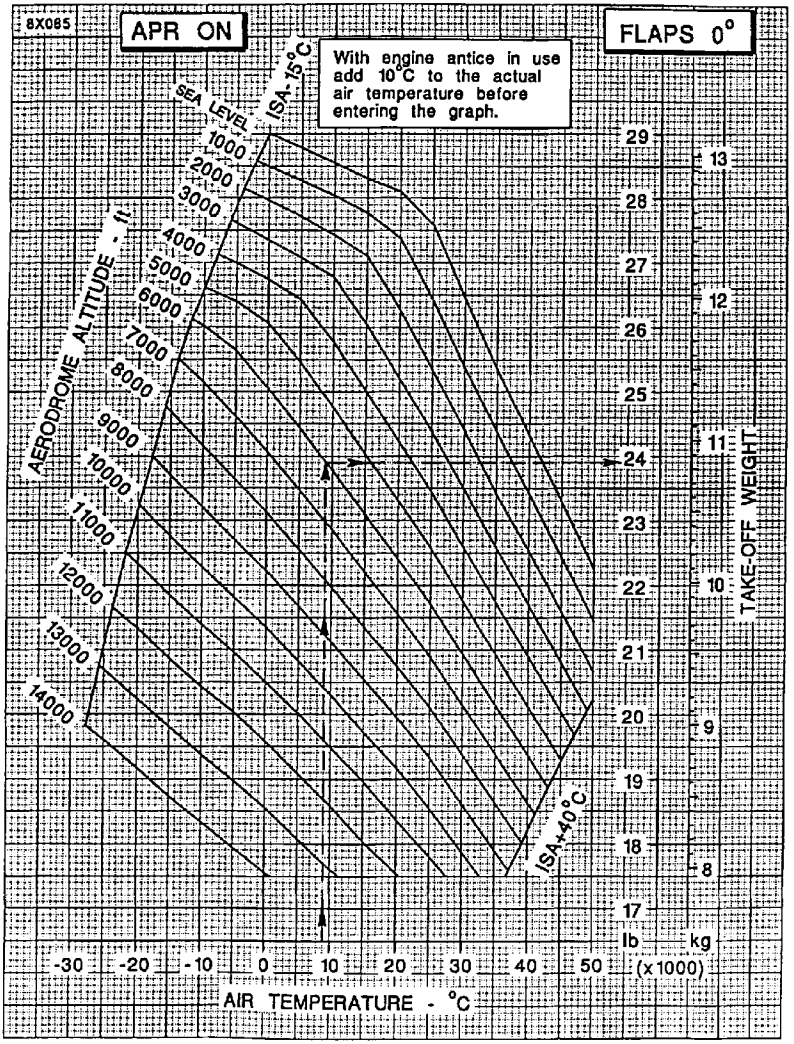


Figure PER-39. Takeoff Weight for D Equals 5,500 Feet (Flaps 0˚)

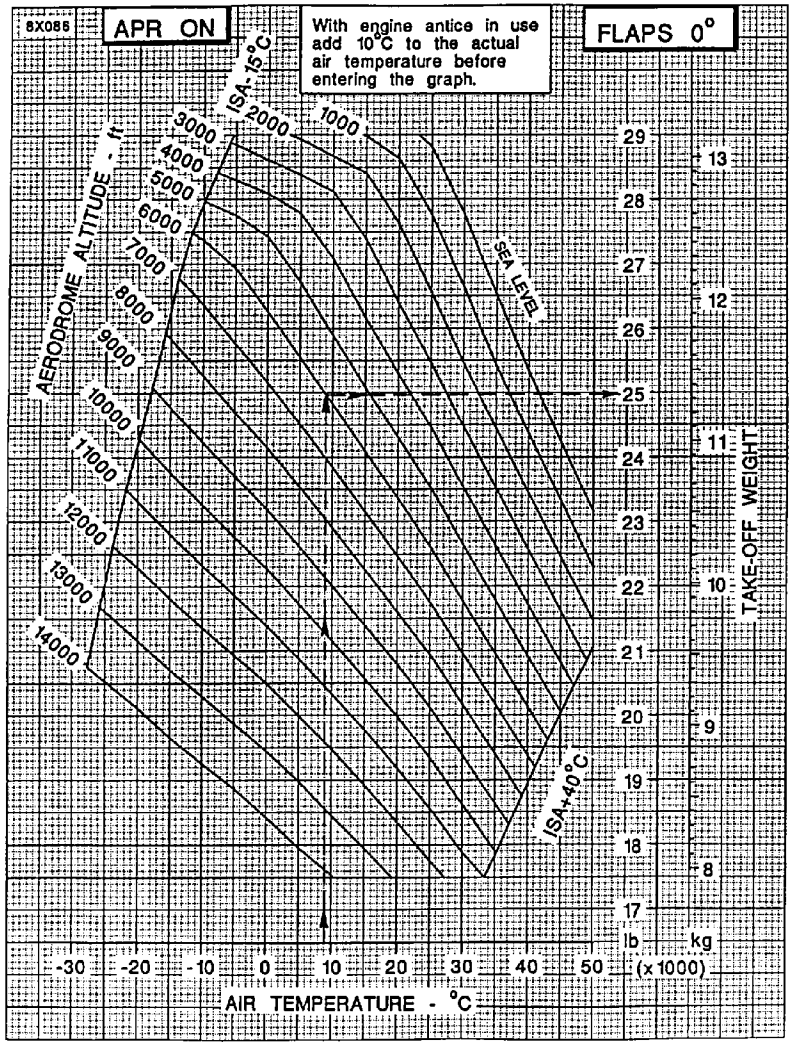


Figure PER-40. Takeoff Weight for D Equals 6,000 Feet (Flaps 0˚)

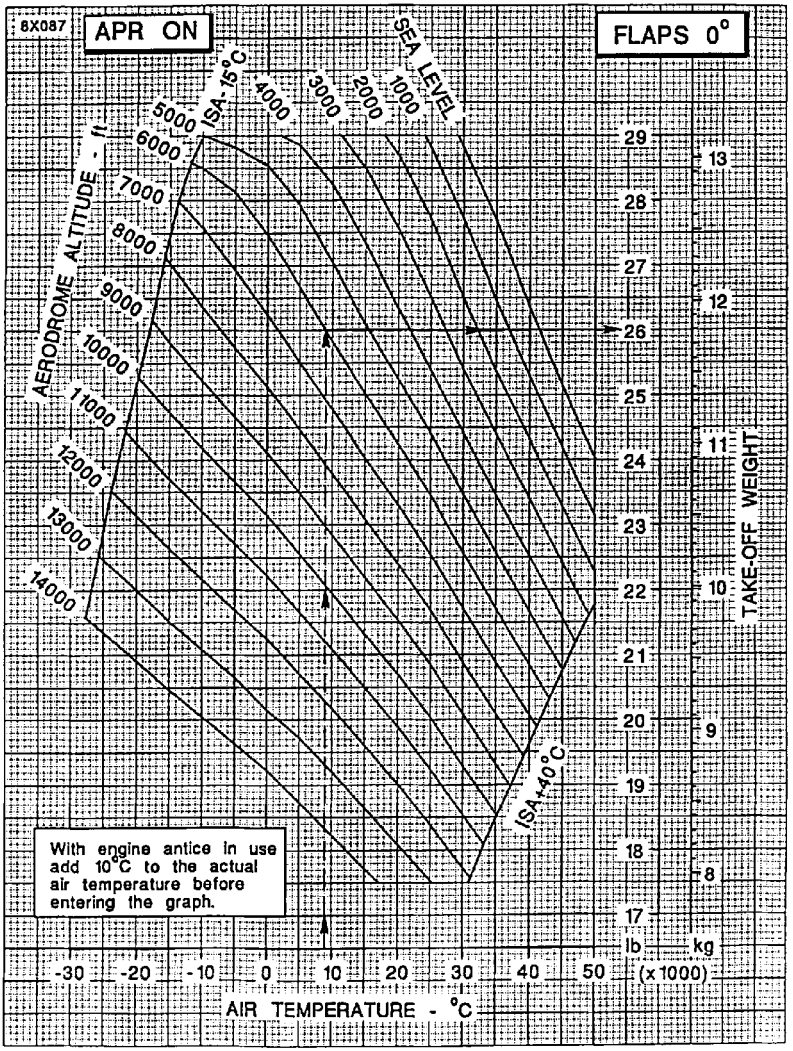


Figure PER-41. Takeoff Weight for D Equals 6,500 Feet (Flaps 0˚)

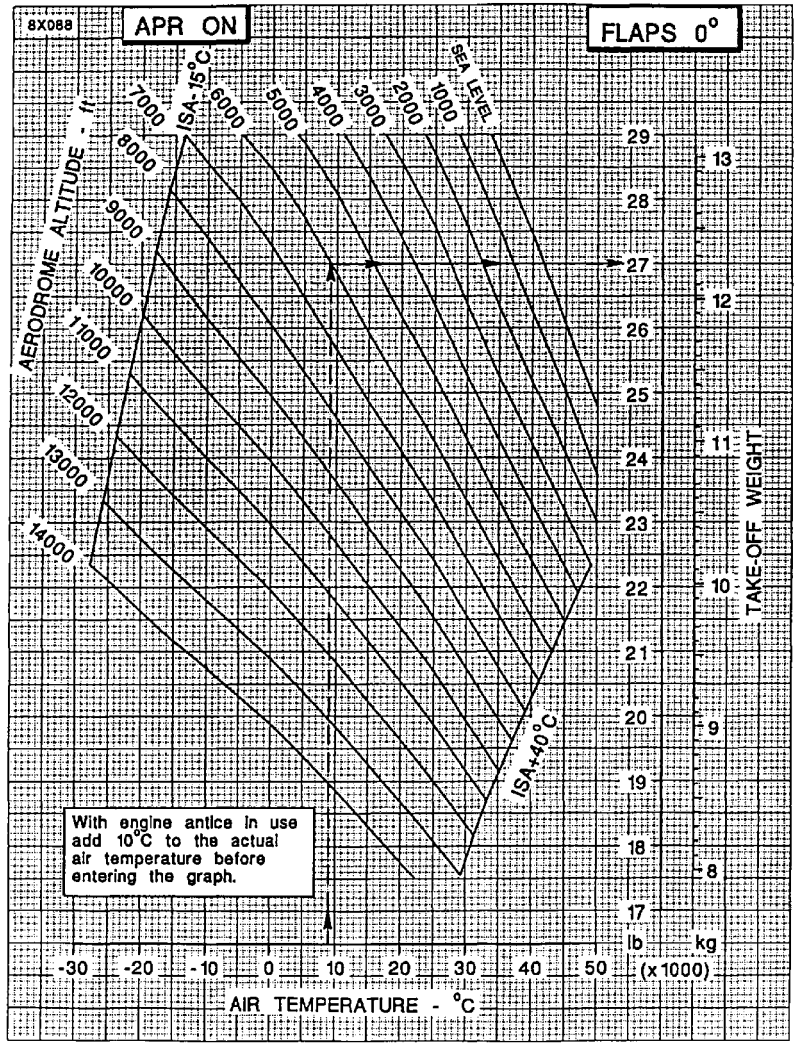


Figure PER-42. Takeoff Weight for D Equals 7,000 Feet (Flaps 0˚)

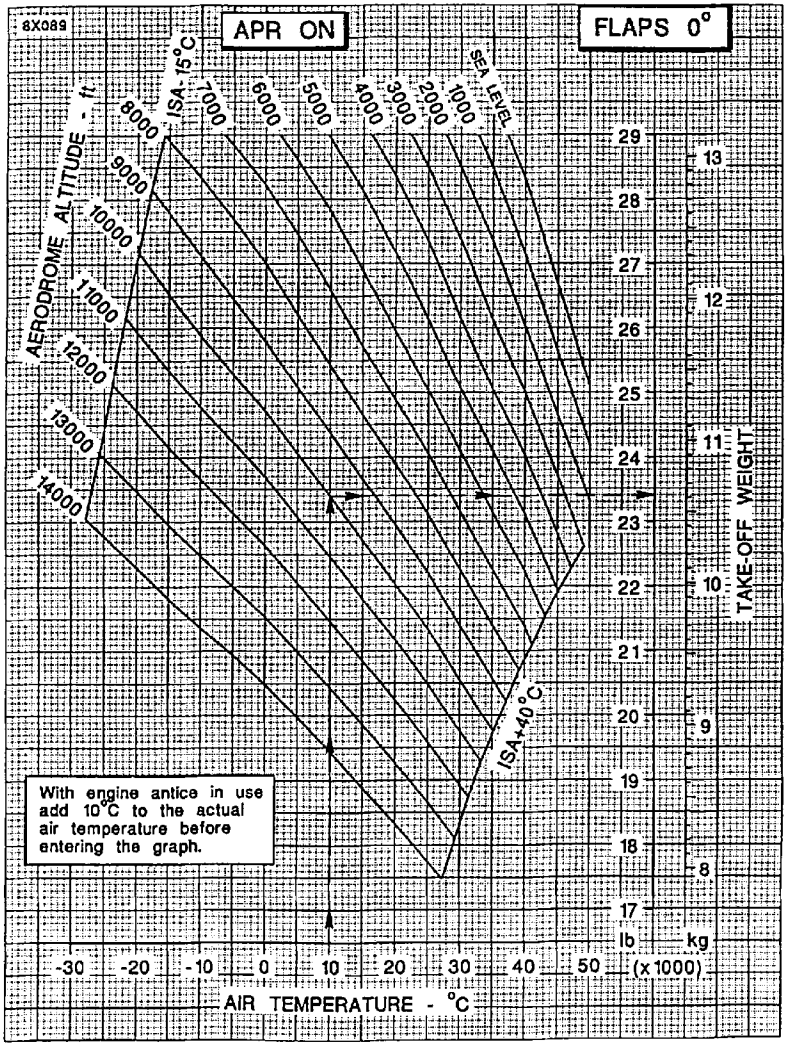


Figure PER-43. Takeoff Weight for D Equals 7,500 Feet (Flaps 0°)

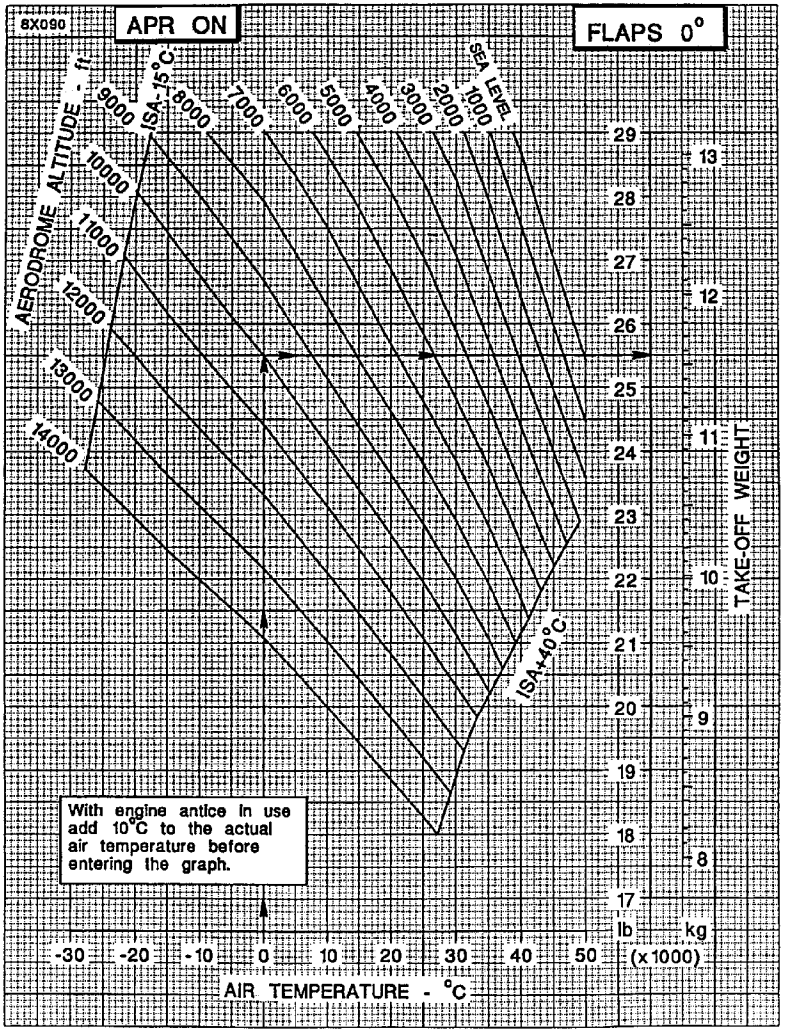


Figure PER-44. Takeoff Weight for D Equals 8,000 Feet (Flaps 0°)

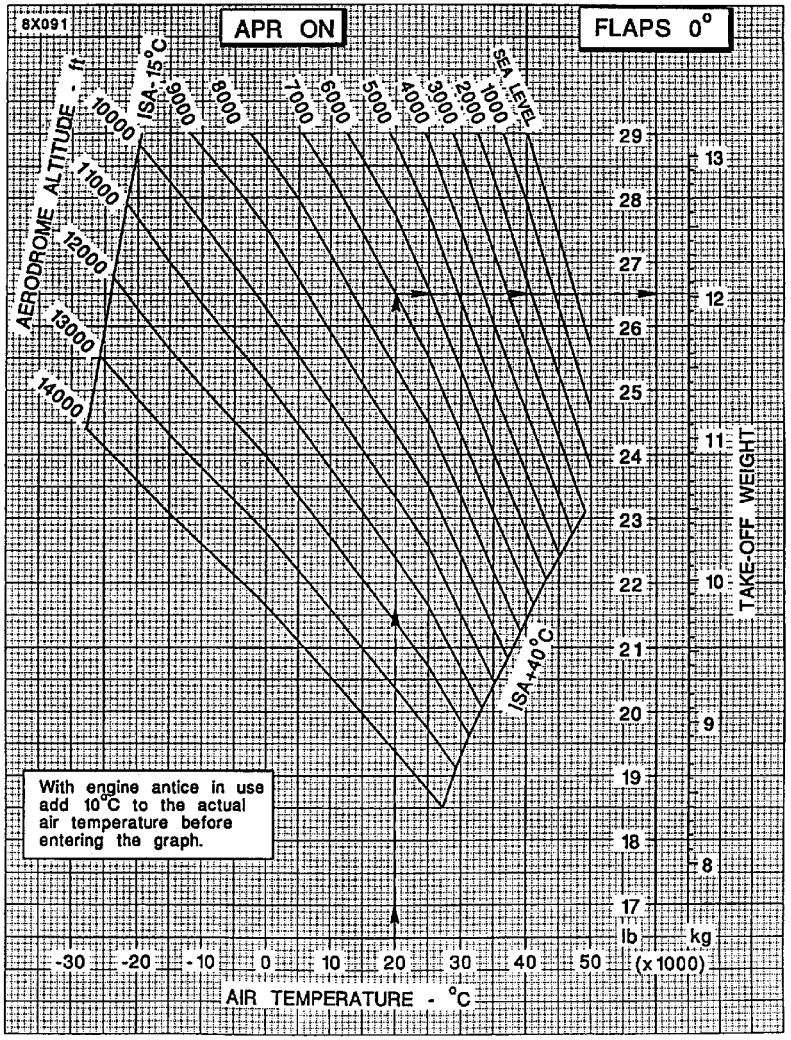


Figure PER-45. Takeoff Weight for D Equals 8,500 Feet (Flaps 0˚)

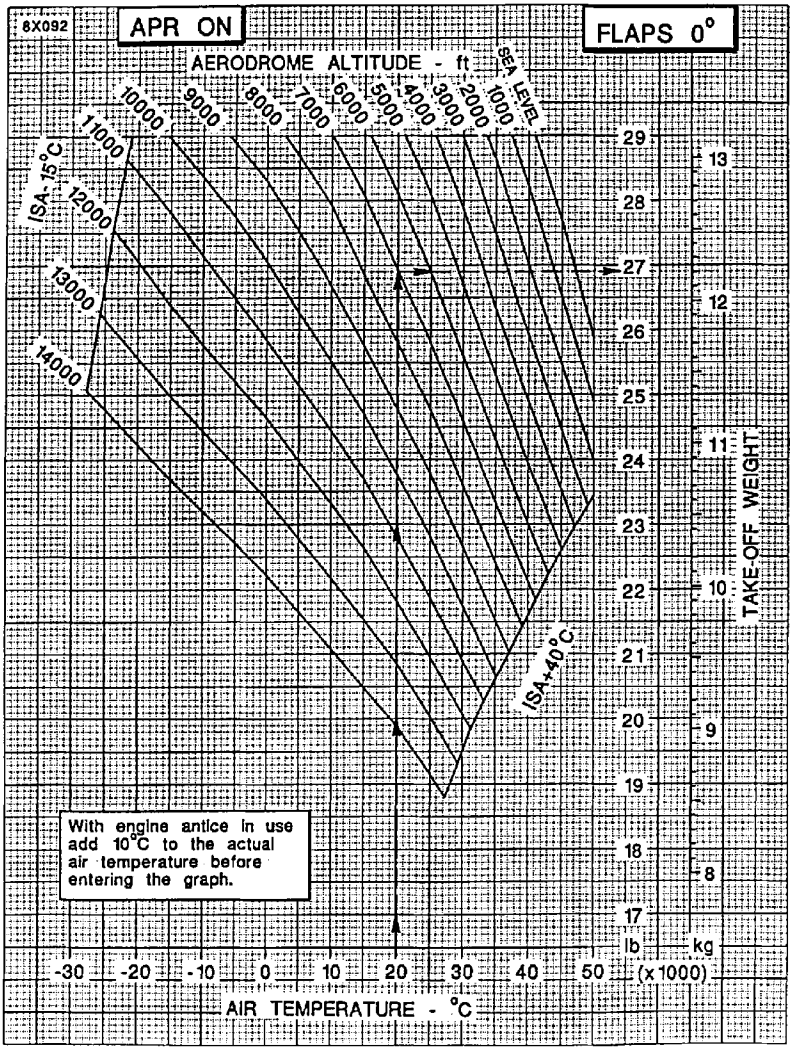


Figure PER-46. Takeoff Weight for D Equals 9,000 Feet (Flaps 0°)

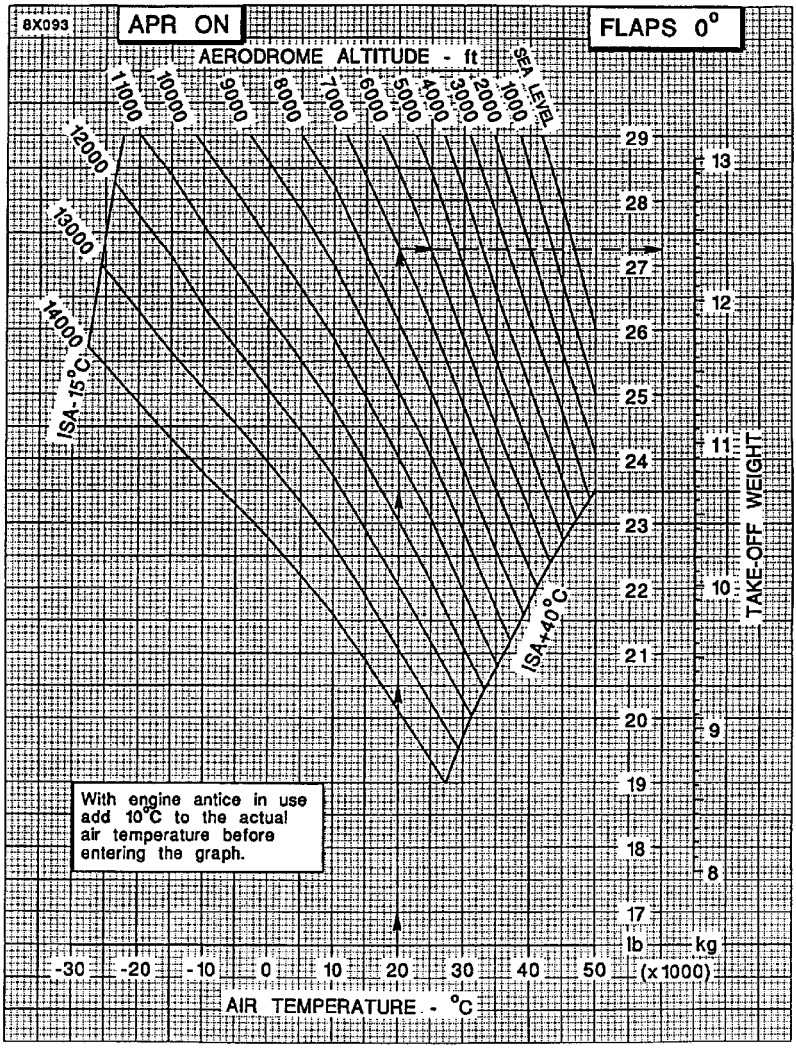


Figure PER-47. Takeoff Weight for D Equals 9,500 Feet (Flaps 0˚)

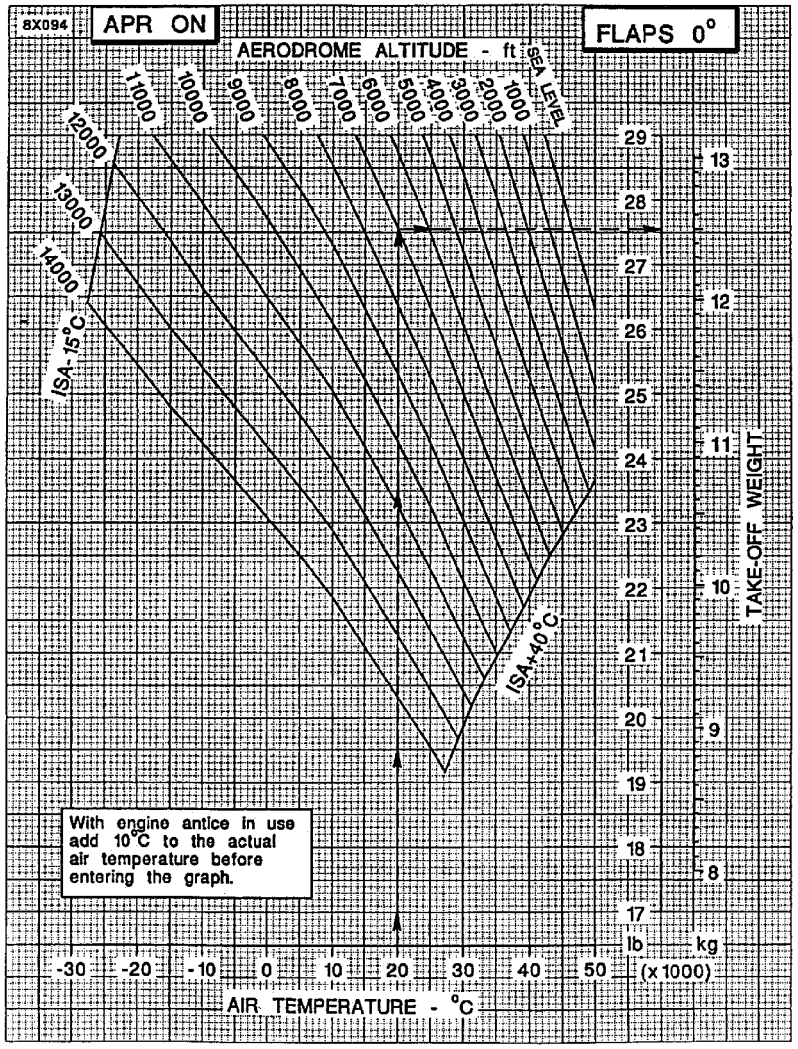


Figure PER-48. Takeoff Weight for D Equals 10,000 Feet (Flaps 0˚)

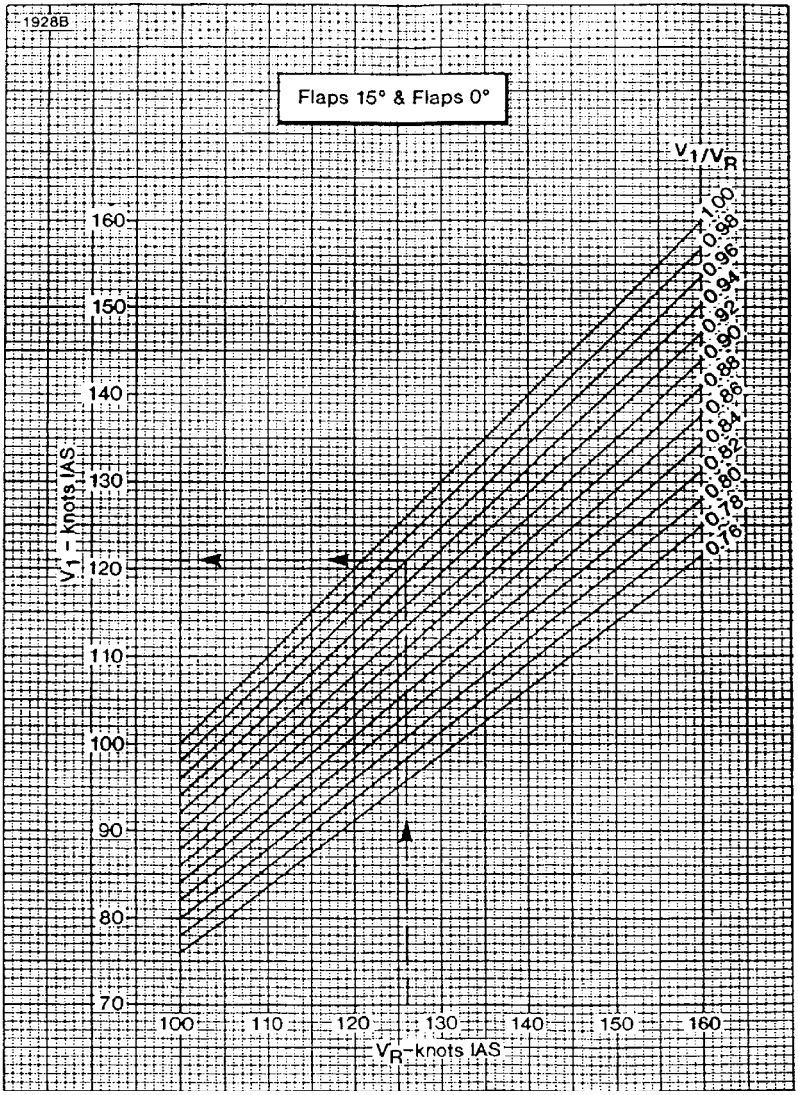


Figure PER-49. Conversion of V_1/V_R Into V_1

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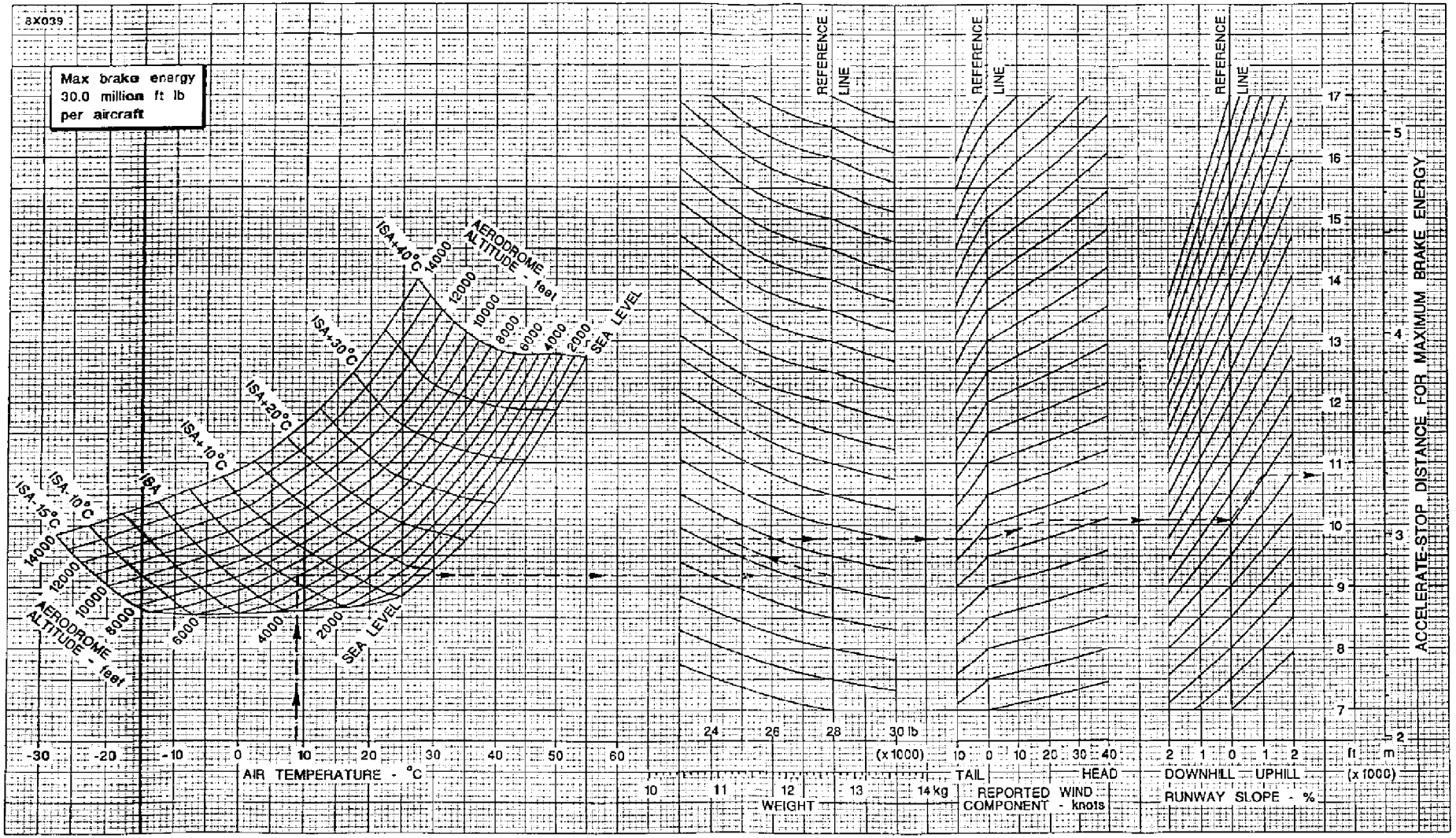


Figure PER-50. Brake Energy Capacity Limitation on Accelerate-Stop Distance

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EXAMPLES

The following examples illustrate the use of the charts.

Example 1

Determine the maximum takeoff weight for the conditions in Table PER-9.

Table PER-9. TAKEOFF FIELD LENGTH—EXAMPLE 1 CONDITIONS

AERODROME PRESSURE ALTITUDE	6,000 FEET
AIR TEMPERATURE	9° C
WIND COMPONENT	20 KNOTS HEADWIND
RUNWAY GRADIENT	1% UPHILL
RUNWAY SURFACE	HARD DRY SURFACE
TAKEOFF DISTANCE AVAILABLE	5,900 FEET
TAKEOFF RUN AVAILABLE	5,500 FEET
ACCELERATE-STOP DISTANCE AVAILABLE	5,500 FEET
FLAP SETTING	0°

- Using the takeoff distance and the accelerate-stop distance available, Figure PER-31 gives the values of D as 5,770 feet and V_1/V_R as 0.938.
- Using the takeoff run and the accelerate-stop distance available, Figure PER-32 gives the values of D as 5,790 feet and V_1/V_R as 0.937
- Using the takeoff distance and the takeoff run available, Figure PER-33 gives the values of D as 6,230 feet for TODA and 6,100 feet for TORA.
- The lowest value of D is 5,770 feet, and the two nearest values are those above it (D_A=6,000 on Figure PER-40) and below it (D_B=5,500 on Figure PER-39).
- From Figure PER-40 read W_A=24,970 lb.
- From Figure PER-39 read W_B=23,900 lb.
- Calculate:

$$W=23{,}900 + \left[\left(\frac{5{,}700 - 5{,}500}{500}\right) X \left(24{,}970 - 23{,}900\right)\right] = 24{,}477 \text{ lb}$$

- From Figure PER-10, V_R at 24,477 lb is 132 knots and V_2 is 132 knots, and both V_R and V_2 are higher than the minimum values.

- The value of V_1/V_R corresponding to the lowest value of D is 0.938 so V_1 is 137 x 0.938 = 124 knots.
- The maximum takeoff weight limited by field length with flaps 0° is therefore 24,477 lb, providing the brake energy limit is not exceeded and V_1 is not below minimum V_1.
- From Figure PER-50 (*AFM* Figure 5.20.10) it can be seen that the accelerate-stop distance for maximum brake energy would be 10,800 feet at a weight of 24,477 lb in the conditions of this example. This is greatly in excess of the 5,500 feet available and the maximum brake energy limit is therefore not exceeded.
- From Figure PER-10 minimum V_1 = 112 knots which is less than the value of V_1 calculated.

Example 2—Effect of Brake Energy Limitations

Determine effect of brake energy limitations for the conditions listed in Table PER-10.

Table PER-10. TAKEOFF FIELD LENGTH—EXAMPLE 2 CONDITIONS

Aerodrome pressure altitude	7,000 feet
Air temperature	20° C
Wind component	10 knots tailwind
Runway gradient	Level
Runway surface	Hard dry surface
Takeoff distance available	11,500 feet
Takeoff run available	11,500 feet
Accelerate-stop distance available	11,800 feet
Flap setting	0°

It is necessary to make a plot of accelerate-stop distance against takeoff weight (Figure PER-51):

- First go through Figures PER-19 to PER-48 in the usual way with the available distances to find a value of D and takeoff weight—in this case D equals 9, 900 feet and TOW equals 27,490 lb.
- Plot this takeoff weight against the accelerate-stop distance used in finding it (point A).

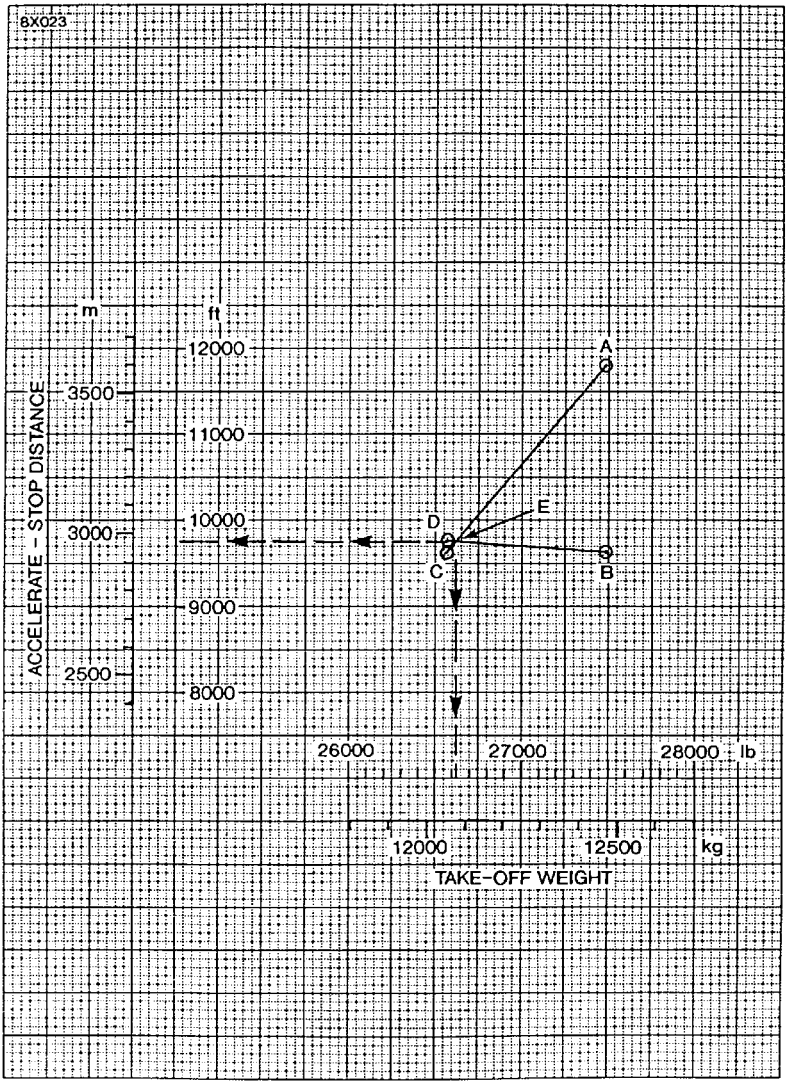


Figure PER-51. Example 2—Takeoff Weight Limited By Brake Energy Capacity

- Enter Figure PER-50 with this takeoff weight and the appropriate altitude, temperature, wind and gradient. Extract the maximum accelerate-stop distance equaling 9,630 feet (this is the accelerate-stop distance at which the energy input to the brakes is the maximum permissible). Plot this distance at point B.

If point B is higher than point A, brake energy is not limiting. However, if B is below A, then brake energy is limiting and weight must be reduced as follows:

- Using the accelerate-stop distance of point B, and the original takeoff run and distance, repeat this first process to find D equaling 8,580 and weight equaling 26,564 lb (point C).

- Using this weight, go through Figure PER-50 again to find a new maximum accelerate-stop distance equaling 9,770 feet (point D).

- The final takeoff weight is then shown by the intersection of AC and BD (point E), which gives 26,620 lb. Point E also shows that the maximum accelerate-stop distance allowable without exceeding the brake energy capacity is 9,760 feet.

- Using this accelerate-stop distance, enter Figure PER-19, PER-20, PER-31 or PER-32, as appropriate, to extract a value of V_1/V_R and hence find V_1 as usual.

SLIPPERY RUNWAY SURFACES

The field length data in Figures PER-19 to PER-48 are based on a hard, dry paved surface. However, the effect of a slippery surface is given for information.

A slippery surface with a coefficient of friction of 0.15 will greatly increase the accelerate-stop distance required. In order that the distance on a slippery runway should not exceed the distance available, the stopping speed should be 40 knots lower than the V_1 obtained from the graphs for a dry surface. This 40-knot reduction from V_1 is valid for a runway with approximately zero gradient and with no tailwind. Takeoff downhill or with a tailwind on a slippery runway should be avoided if possible. The limiting combinations of wind and runway gradient for which the 40-knot reduction from V_1 is valid are shown on Figure PER-52 (*AFM* Figure 5.20.12). Combinations of wind and gradient lying in the shaded area are not permitted.

NOTE

The 40-knot lower stopping speed is not a V_1 (decision speed), but a speed from which the aircraft can be stopped within the accelerate-stop distance available.

V_1 AT REDUCED WEIGHT

The method described on the previous page gives V_1 for the maximum permissible weight for the runway. When the required weight is below the maximum, a range of V_1 can safely by used. Either of the following rule may be used to give a V_1 within the safe range.

- Use the same V_1/V_R as for maximum permissible weight, provided that V_1 is not less than minimum V_1.
- If a higher value is desired, use the same V_1 in knots IAS as for maximum permissible weight provided that it does not exceed V_R for the actual weight.

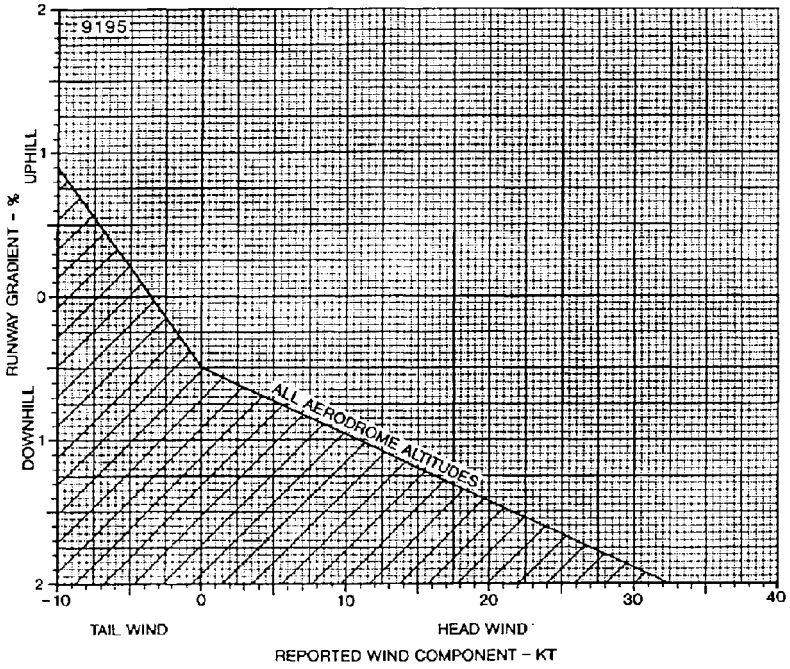


Figure PER-52. Wind and Gradient Restrictions for Accelerate-Stop on Slippery Runway

NET TAKEOFF FLIGHT PATH

INTRODUCTION

The charts in this section are provided to enable a complete net takeoff flight path to be constructed, should it be necessary to establish that any obstacles along the intended line of flight will be cleared by the safety margin required by the relevant operating regulations. Once it has been established beyond all doubt that the obstacles will be cleared, there is no need to proceed further with the calculation.

For close in obstacles Figures PER-53 (*AFM* Figure 5.25.2) and PER-55 (*AFM* Figure 5.25.4) provide basic "straight climb out" second segment data for takeoff flap settings of 15° and 0°. Figures PER-54, PER-56, PER-57 and PER-58 (*AFM* Figure 5.25.3, 5.25.5, 5.55.3, 5.25.6) enable the full takeoff net flight path to be constructed.

The radius of steady turn which is to be used for a change of heading greater than 15° is shown on Figure PER-59 (*AFM* Figure 5.25.7).

When takeoff is to be made in a headwind greater than 40 knots, performance appropriate to not more than 40 knots is to be read on the charts.

DEFINITIONS

Reference Zero—This is the zero to which the coordinates of the various points on the flight path are referred. It is defined by a vertical datum which passes through the 35 feet height point at the end of the takeoff distance required, and a horizontal datum 35 feet below this point.

3 1/2 Minute Point—The point at which three and a half minutes have elapsed since start of takeoff. At this point a level acceleration to final takeoff climb speed commences.

This point has been selected in order that acceleration can be completed within the five-minute takeoff power limitations.

Five Minute Point—The point at which five minutes have elapsed since the start of takeoff. At this point APR must be canceled and power reduced to maximum continuous.

First Segment—This extends from the end of the takeoff distance required to the point at which the landing gear is fully retracted. Since it takes place in ground effect, the climb gradient always exceeds the second segment free air gradient. For simplicity of presentation, it is assumed that first segment gradient is equal to that of the second segment and that the second segment starts at 35 feet and the retraction complete point is not shown.

Second Segment—This extends from 35 feet (see above) to a height of 1,500 feet or until the three-and-a-half-minute point is reached, whichever comes first.

Third Segment—During this segment the aircraft accelerates in level flight from V_2 to final takeoff climb speed on maximum thrust. The height may be 1,500 feet or some lower height. If takeoff was with flaps 15°, flaps are selected up at V_2 +10 knots.

Fourth Segment—During this segment the aircraft completes the climb to 1,500 feet in those cases where acceleration took place at a lower height.

Fifth Segment—The aircraft is accelerated from V_{FTO} to V_{ERC} during this segment.

PRESENTATION

The net takeoff flight path consists of up to five segments. The information is presented on two charts for each flap setting to the end of the fourth segment, plus a further chart independent of flap setting which enables the fifth segment to be calculated.

Because the first segment climb gradient will always be better than the second segment gradient, the first segment performance of the flight path is not given but the second segment is assumed to commence at 35 feet and the landing gear retraction complete point is ignored.

The construction is based on the assumption that the aircraft is flown in the following manner:

- Engine failure occurs at V_1 and APR thrust is automatically applied.
- Landing gear is selected up immediately after lift-off. At the end of the takeoff distance—where the net flight path begins—the landing gear is still retracting. The speed is V_2 appropriate to the flap setting.
- The climb is continued at V_2 and takeoff thrust until three and a half minutes have elapsed form the start of takeoff or until the aircraft reaches 1,500 feet, whichever comes first.
- From this point the aircraft is accelerated in level flight to the final takeoff climb speed, V_{FTO} (Figure PER-17). If takeoff was with flaps 15°, then they are selected up during the acceleration at V_2 + 10 knots or at V_{FTO} whichever is lower.
- When the flaps have been retracted and the final takeoff climb speed achieved, the climb is continued if necessary to 1,500 feet.
- APR is cancelled and thrust reduced to maximum continuous at the five-minute point. Finally the aircraft is accelerated to the enroute climb speed.

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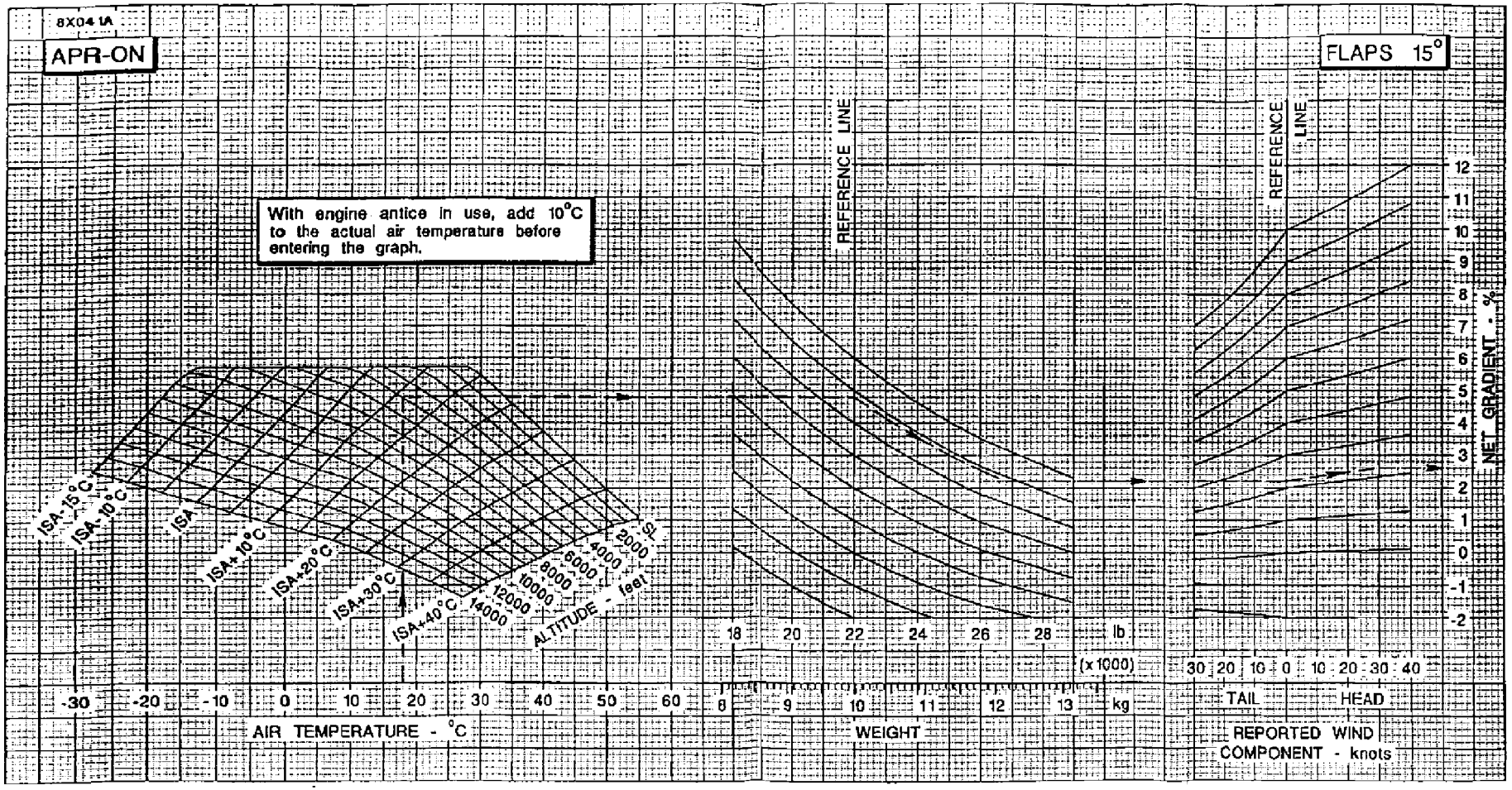


Figure PER-53. Net Takeoff Flight Path—Second Segment Net Gradient (Flaps 15˚)

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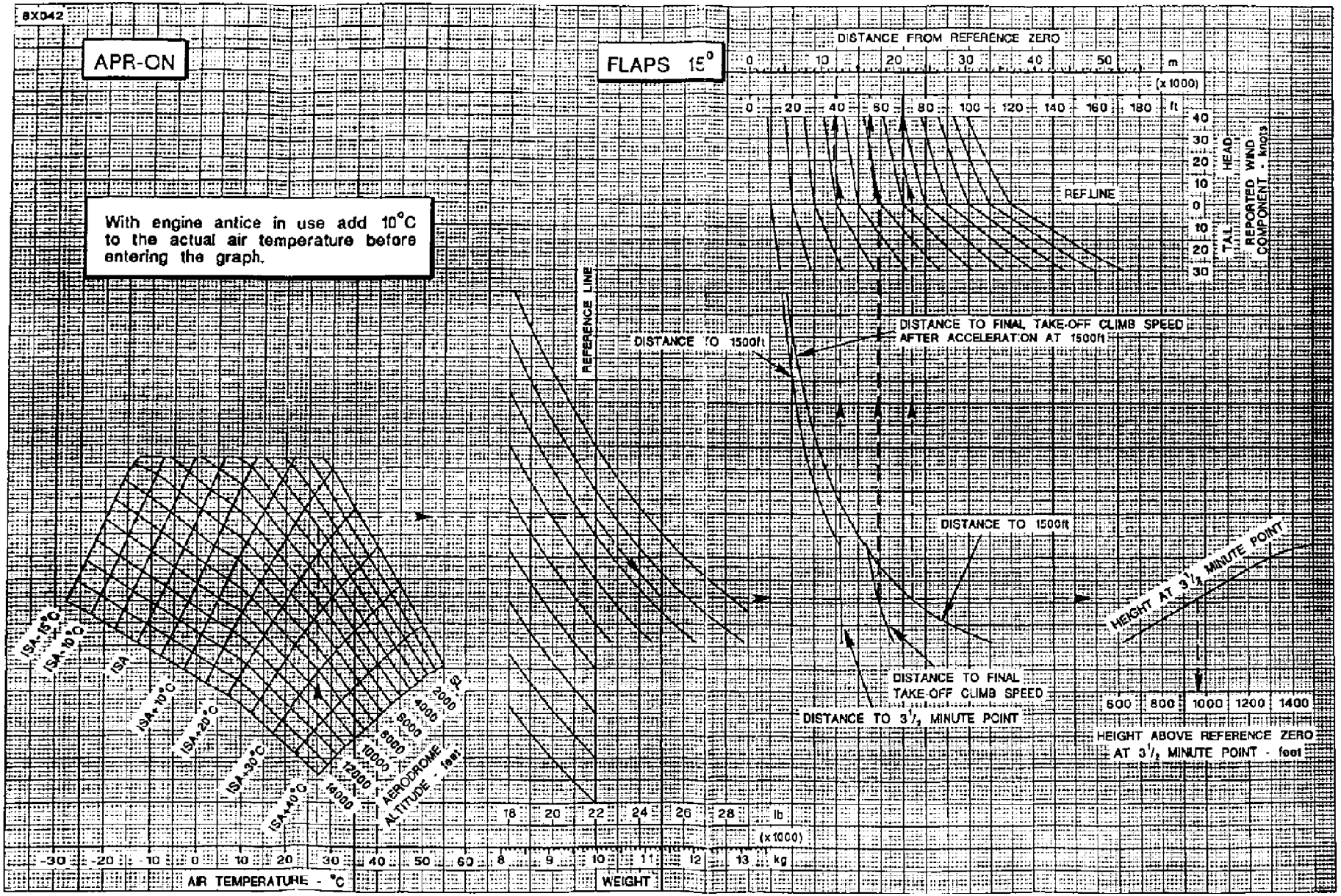


Figure PER-54. Net Takeoff Flight Path—Second, Third and Fourth Segments (Flaps 15°)

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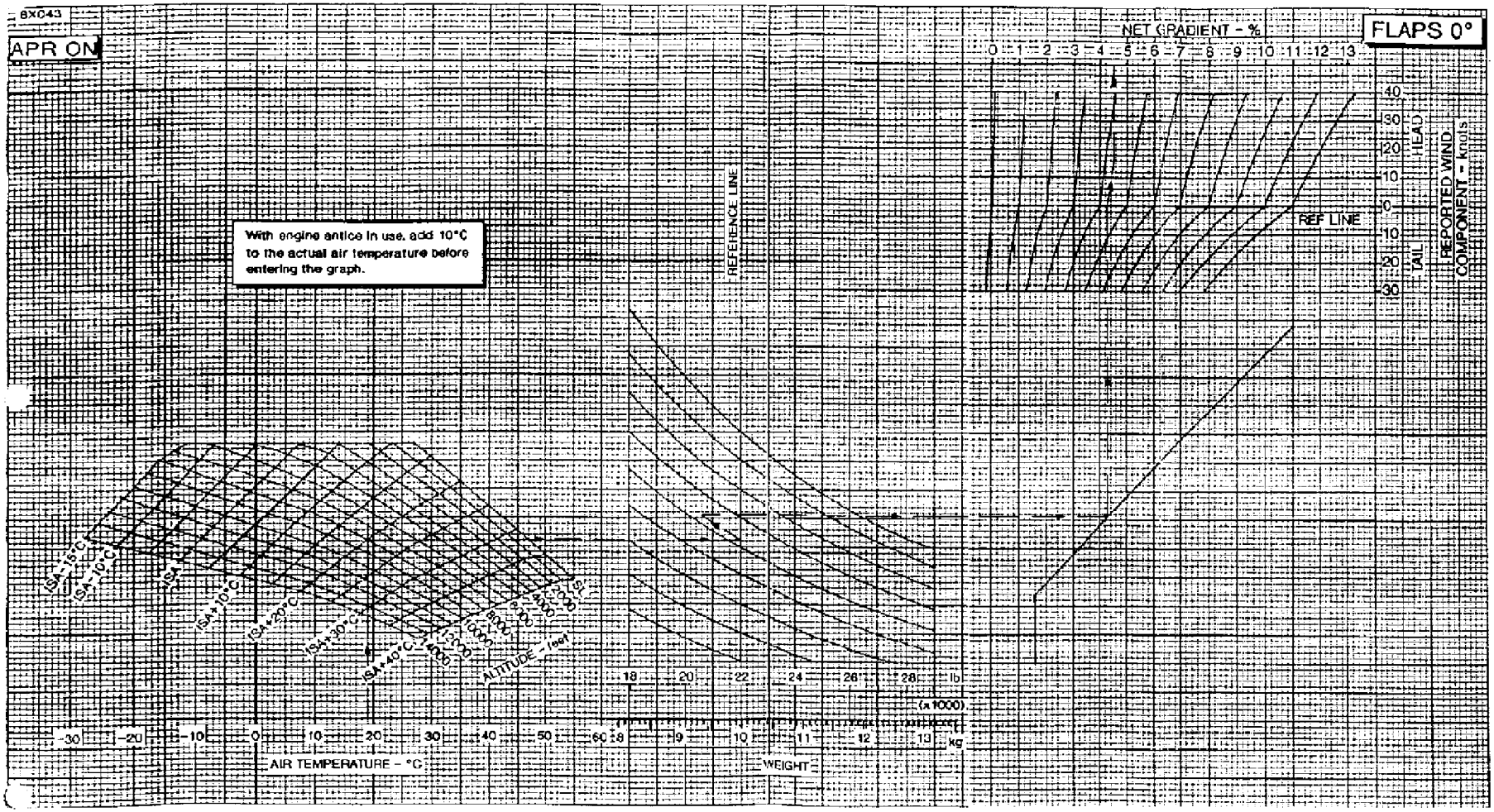


Figure PER-55. Net Takeoff Flight Path—Second Segment Net Gradient (Flaps 0˚)

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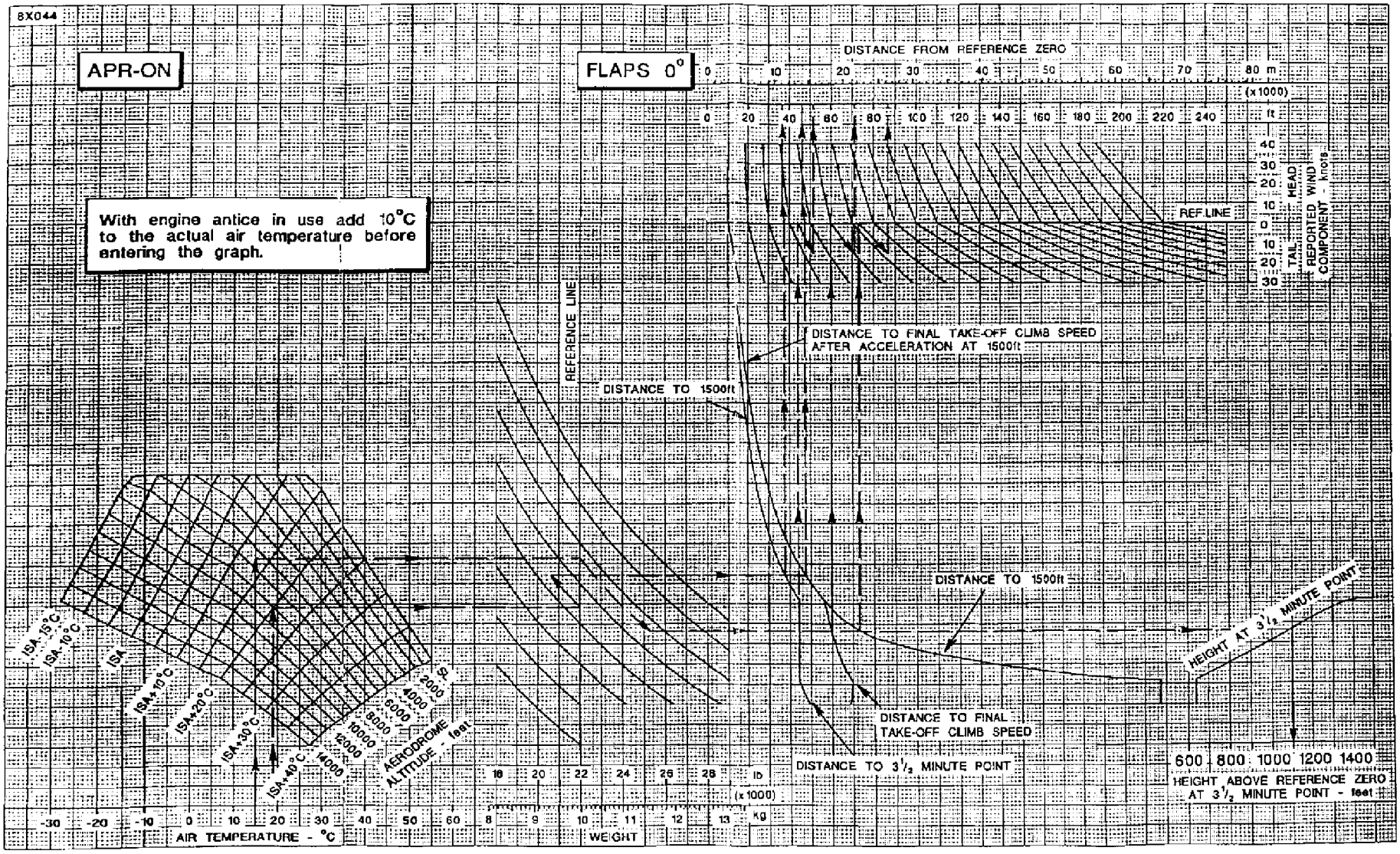


Figure PER-56. Net Takeoff Flight Path—Second, Third and Fourth Segments (Flaps 0°)

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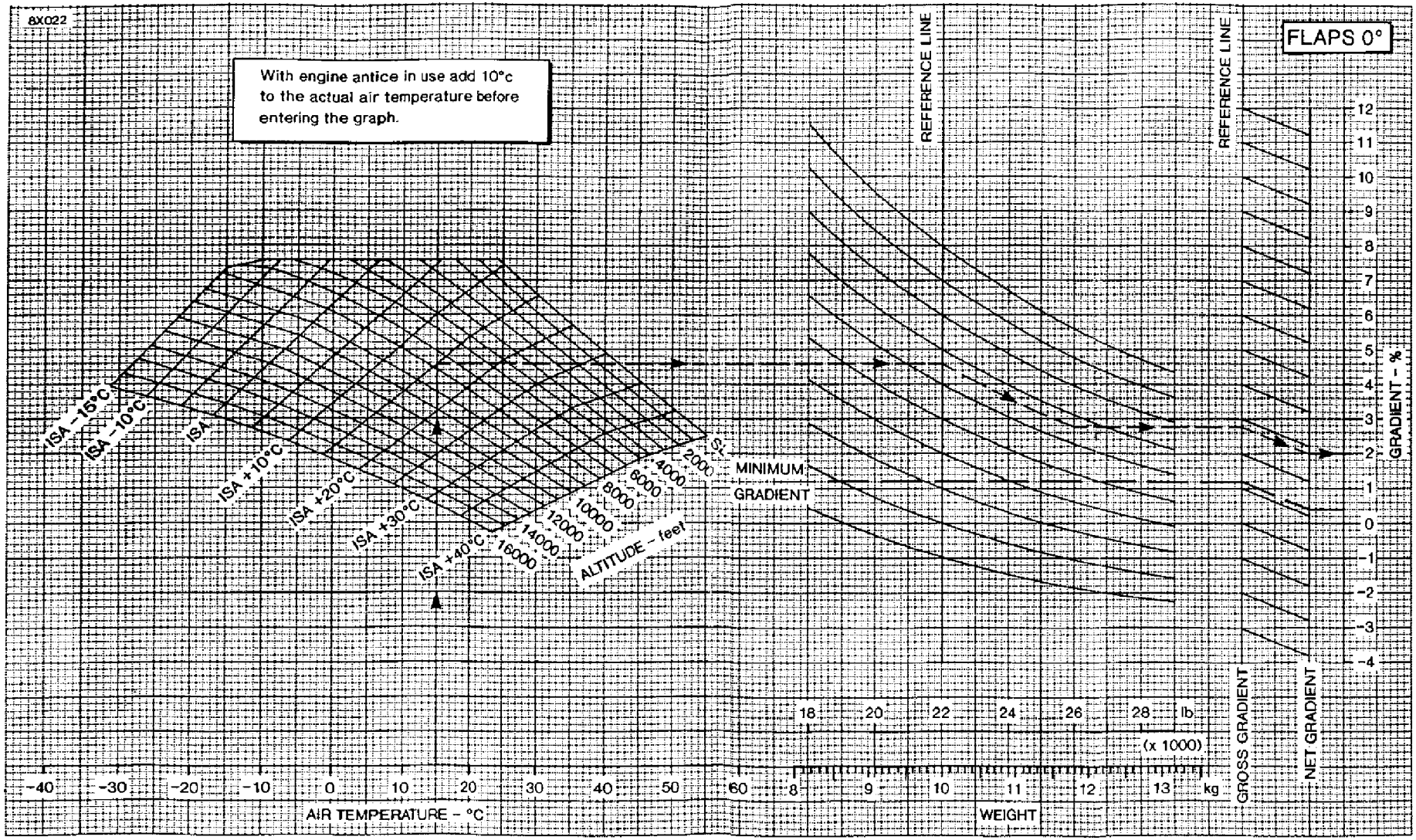


Figure PER-57. Final Takeoff Climb Gradient

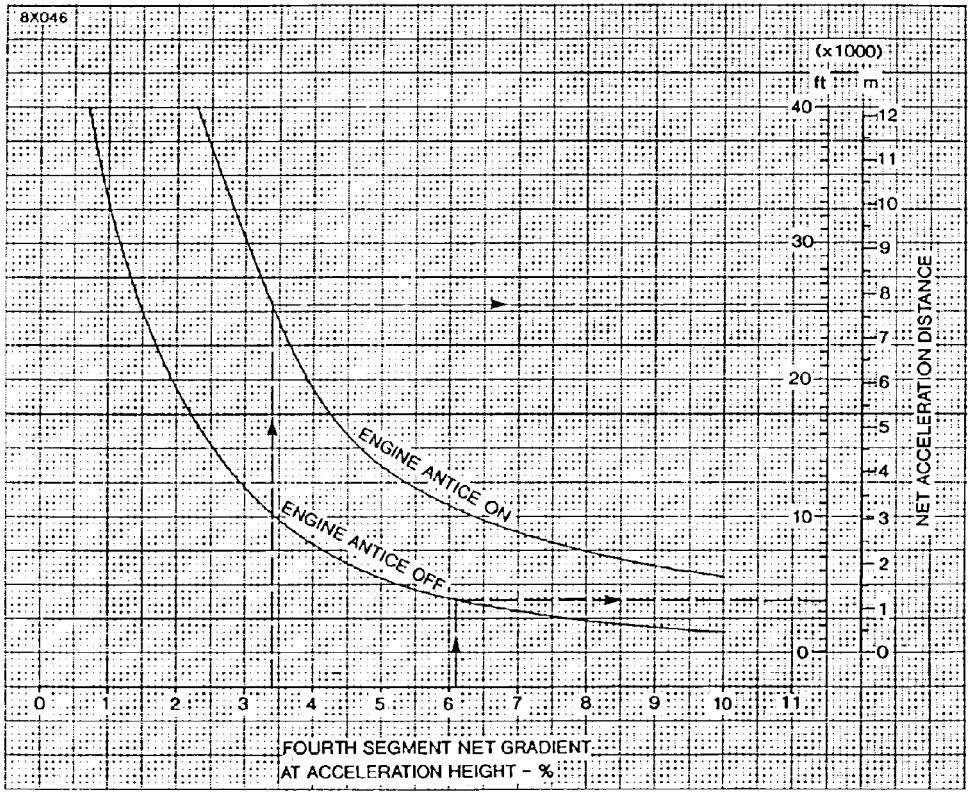


Figure PER-58. Fifth Segment Net Acceleration Distance

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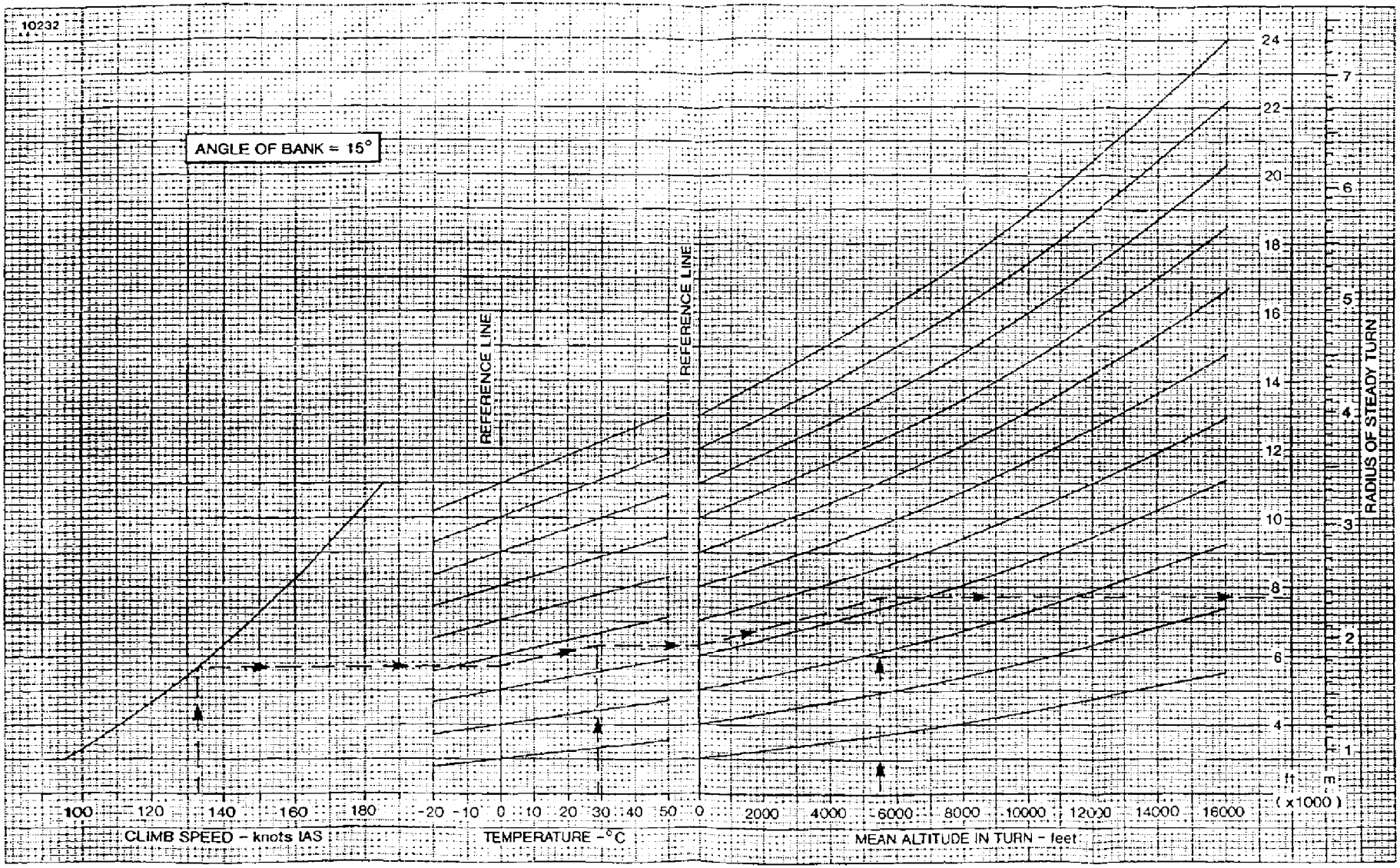


Figure PER-59. Radius of Steady Turn

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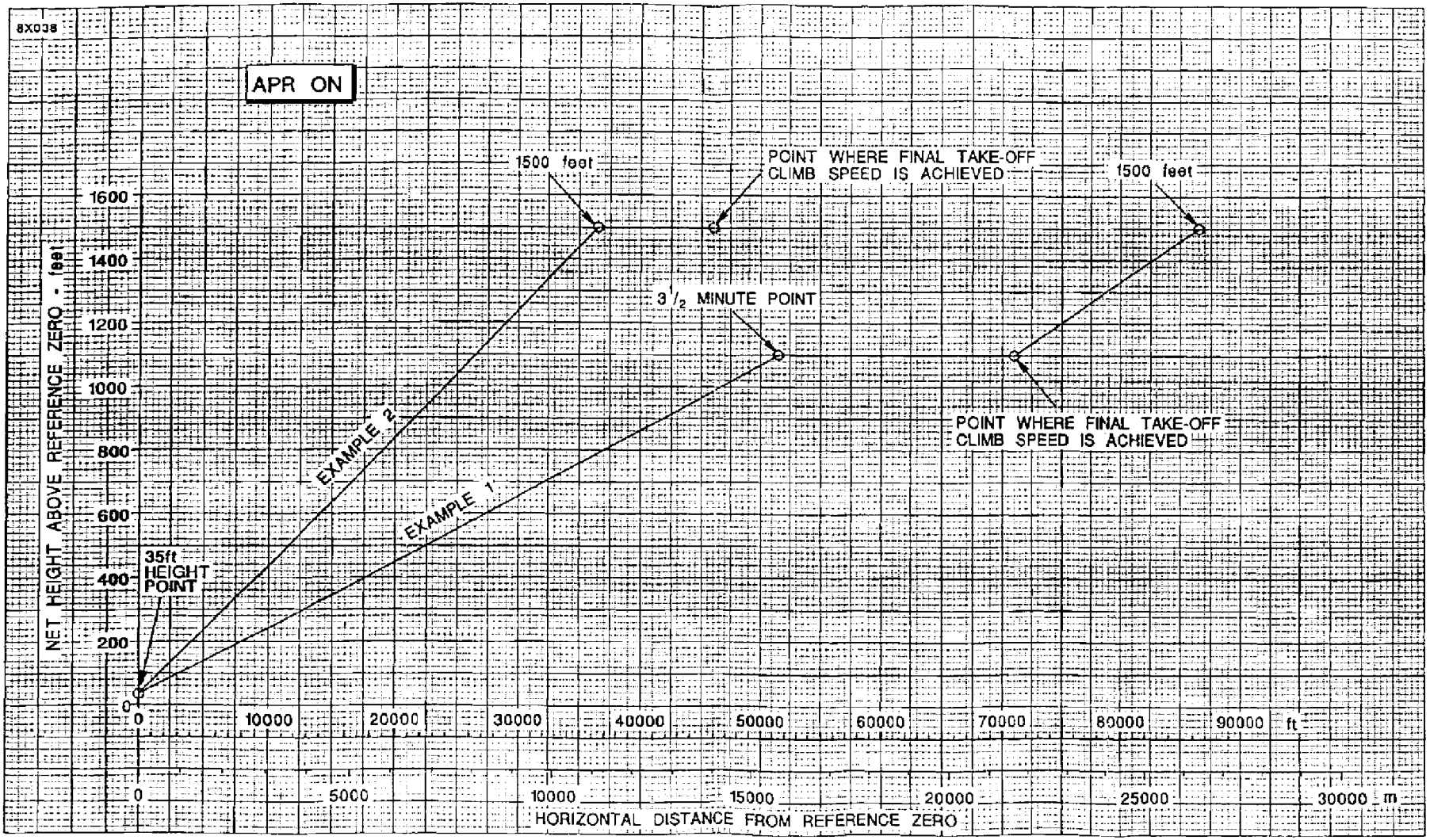


Figure PER-60. Net Flight Path—Examples

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ILLUSTRATED EXAMPLES

Figure PER-60 shows two examples of the use of the flight path charts. A further example where only the second segment needs to be considered is also provided.

Example 1

Refer to the conditions given in Table PER-11.

Table PER-11. NET TAKEOFF FLIGHT PATH—EXAMPLE 1 CONDITIONS

FLAPS	0°
WEIGHT	25,300 LB
AIR TEMPERATURE	15° C
AERODROME ALTITUDE	6,500 FEET
REPORTED WIND COMPONENT	15 KNOTS TAILWIND
ENGINE ANTI-ICE	OFF

From Figure PER-56 the height above reference zero at the three-and-a-half-minute point is 1,100 feet. Also from this figure the horizontal distance from reference zero to:

- The three-and-a-half-minute point is 51,500 feet
- Achievement of final takeoff climb speed is 71,000 feet
- Reach 1,500 feet is 86,500 feet

The flight path to 1,500 feet is shown on Figure PER-60. It may be extended to the point at which enroute climb speed is achieved as follows:

- With the lapse rate resulting in a 3° C lower temperature, the fourth segment (final takeoff climb) net gradient from Figure PER-57 (*AFM* Figure 5.55.3) is 2.4 % at 1,500 feet above the aerodrome.
- Figure PER-58 then gives a fifth segment acceleration distance of 16,000 feet.

Therefore, the total distance to the point at which enroute climb speed is achieved is 86,500 + 16,000 = 102,500 feet from reference zero.

Example 2

Refer to the conditions given in Table PER-12.

Table PER-12. NET TAKEOFF FLIGHT PATH—EXAMPLE 2 CONDITIONS

FLAPS	0°
WEIGHT	20,600 LB
AIR TEMPERATURE	19° C
AERODROME ALTITUDE	8,000 FEET
REPORTED WIND COMPONENT	10 KNOTS HEADWIND
ENGINE ANTI-ICE	OFF

Using Figure PER-56, this example comes in the area where acceleration takes place at 1,500 feet and the horizontal distance from reference zero to:

- 1,500 feet is 36,500 feet
- Achieve final takeoff climb speed is 46,000 feet

The flight path to the point at which final takeoff climb speed is achieved is shown on Figure PER-60. It may be extended to the point at which enroute climb speed is achieved. Using the same method as in Example 1, the fourth segment net gradient is 3.35% (at 9,500 feet, 16° C) and the fifth segment acceleration distance is 10,400 feet.

Therefore, the total distance to the enroute climb speed is 46,000 + 10,400 = 56,400 feet.

Example 3

Refer to the conditions given in Table PER-13.

Table PER-13. NET TAKEOFF FLIGHT PATH—EXAMPLE 3 CONDITIONS

FLAPS	0°
WEIGHT	20,600 LB
AIR TEMPERATURE	19° C
AERODROME ALTITUDE	8,000 FEET
REPORTED WIND COMPONENT	16 KNOTS HEADWIND
ENGINE ANTI-ICE	OFF

In a case where only the second segment needs to be considered, and particularly where the obstacles are close in, it may be more convenient to obtain points on the flight path by using the second segment net gradient charts, Figures PER-53 and PER-55.

Find the height of the flight path at 1,000 feet from reference zero. The second segment gradient is found from Figure PER-55 to be 4.5%.

Then the height gained in the second segment equals:

$$\frac{4.5}{100} \times 1{,}000 = 45 \text{ feet}$$

And, the height above reference zero equals:

$$45 + 35 = 80 \text{ feet}$$

NOTE

If the height gained during the second segment climb is significant, then the gradient must be read at the mean altitude during the climb allowing a temperature reduction of 2° for every 1,000-foot altitude above the airfield.

NET TAKEOFF FLIGHT PATH SECOND SEGMENT NET GRADIENT—FLAPS 15°

Figure PER-53 shows the second segment net gradient of climb.

Associated Conditions

Refer to the conditions given in Table PER-14.

Table PER-14. ASSOCIATED CONDITIONS FOR NET FLIGHT PATH—SECOND SEGMENT (FLAPS 15°)

ENGINES	ONE ENGINE OPERATING AT MAXIMUM THRUST WITH APR ON
ENGINE BLEED AIR	ALL AIR BLEEDS OFF; SEE NOTE 1 FOR THE EFFECT OF ENGINE ANTI-ICE BLEED
FLAPS	15°
LANDING GEAR	UP
AIRSPEED	TAKEOFF SAFETY SPEED V_2 (SEE FIGURE PER-8)

NOTE
1. TO TAKE ACCOUNT OF ENGINE ANTI-ICE BLEED, ADD 10° C TO THE ACTUAL AIR TEMPERATURE BEFORE ENTERING THE CHART.
2. THE WIND GRID IS FACTORED IN SUCH A WAY THAT AN EFFECT OF NOT MORE THAN 50% OF HEADWINDS AND NOT LESS THAN 150% OF TAILWINDS IS OBTAINED. REPORTED WINDS MAY THEREFORE BE USED DIRECTLY IN THE GRID.

Instructions for Use of Chart

The use of the chart is illustrated by the arrowed broken lines:

- Enter the chart with the air temperature and move up to the appropriate mean altitude.
- Proceed horizontally to the weight grid reference line and then follow the guidelines to the appropriate weight.
- Finally proceed to the wind reference line and through the wind correction grid to read net gradient.

NET TAKEOFF FLIGHT PATH SECOND, THIRD AND FOURTH SEGMENTS—FLAPS 15°

Figure PER-54 shows the distance from reference zero to the end of the second, third, and where appropriate fourth, segments of the flight path.

Associated Conditions

Refer to the conditions given in Table PER-15.

Table PER-15. ASSOCIATED CONDITIONS FOR NET TAKEOFF FLIGHT PATH—SECOND, THIRD AND FOURTH SEGMENTS (FLAPS 15˚)

ENGINES	SECOND AND THIRD SEGMENTS: ONE ENGINE OPERATING AT MAXIMUM THRUST WITH APR ON. FOURTH SEGMENT: ONE ENGINE OPERATING AT MAXIMUM CONTINUOUS THRUST.
ENGINE BLEED AIR	ALL AIR BLEEDS OFF, SEE NOTE 1 FOR THE EFFECT OF ENGINE ANTI-ICE BLEED.
FLAPS	15°; RETRACTED AT V_2 + 10 KNOTS.
LANDING GEAR	UP
AIRSPEED	TAKEOFF SAFETY SPEED V_2 (SEE FIGURE PER-8) INCREASING TO V_{FTO} (SEE FIGURE PER-12) AT END OF THIRD SEGMENT.

NOTE

1. TO TAKE ACCOUNT OF ENGINE ANTI-ICE BLEED, ADD 10° C TO THE ACTUAL AIR TEMPERATURE BEFORE ENTERING THE CHART.
2. THE WIND GRID IS FACTORED IN SUCH A WAY THAT AN EFFECT OF NOT MORE THAN 50% OF HEADWINDS AND NOT LESS THAN 150% OF TAILWINDS IS OBTAINED. REPORTED WINDS MAY THEREFORE BE USED DIRECTLY IN THE GRID.

Instructions for Use of Chart

The use of the chart is illustrated by the arrowed broken lines:

- Enter the chart with the air temperature and move up to the appropriate airfield altitude.
- Proceed horizontally to the weight grid reference line and then follow the curve to the appropriate weight.
- Proceed horizontally across to intersect the line on the far right and then downwards to read height at the three and a half minute point on the bottom scale.
- Proceed upwards from the intersection with the distance curves through the wind correction grid to read distances to the three-and-a-half-minute point, to the achievement of final takeoff climb speed and to 1,500 feet.

- In those cases where the reading on the height scale is at 1,500 feet, the level acceleration (third segment) takes place at 1,500 feet and there is no fourth segment.

NET TAKEOFF FLIGHT PATH SECOND SEGMENT NET GRADIENT—FLAPS 0°

Figure PER-55 shows the second segment net gradient of climb at the mean height of this segment.

Associated Conditions

Refer to the conditions given in Table PER-16.

Table PER-16. ASSOCIATED CONDITIONS FOR NET TAKEOFF FLIGHT PATH—SECOND SEGMENT (FLAPS 0°)

ENGINES	ONE ENGINE OPERATING AT MAXIMUM THRUST WITH APR ON.
ENGINE BLEED AIR	ALL AIR BLEEDS OFF; SEE NOTE 1 FOR THE EFFECT OF ENGINE ANTI-ICE BLEED.
FLAPS	0°
LANDING GEAR	UP
AIRSPEED	TAKEOFF SAFETY SPEED V_2 (SEE FIGURE PER-10)

NOTE

1. TO TAKE ACCOUNT OF ENGINE ANTI-ICE BLEED, ADD 10° C TO THE ACTUAL AIR TEMPERATURE BEFORE ENTERING THE CHART.
2. THE WIND GRID IS FACTORED IN SUCH A WAY THAT AN EFFECT OF NOT MORE THAN 50% OF HEADWINDS AND NOT LESS THAN 150% OF TAILWINDS IS OBTAINED. REPORTED WINDS MAY THEREFORE BE USED DIRECTLY IN THE GRID.

Instructions for Use of Chart

The use of the chart is illustrated by the arrowed broken lines:

- Enter the chart with the air temperature and move up to the appropriate aerodrome altitude.
- Proceed horizontally to the weight grid reference line and then follow the guidelines to the appropriate weight.
- Move horizontally to the line on the right.
- Finally proceed upwards to the wind reference line and through the wind correction grid to obtain the net gradient.

NET TAKEOFF FLIGHT PATH SECOND, THIRD AND FOURTH SEGMENTS—FLAPS 0°

Figure PER-56 shows the distance from reference zero to the end of the second, third, and where appropriate fourth, segments of the flight path.

Associated Conditions

Refer to the conditions given in Table PER-17.

Table PER-17. ASSOCIATED CONDITIONS FOR NET TAKEOFF FLIGHT PATH—SECOND, THIRD AND FOURTH SEGMENTS (FLAPS 0˚)

ENGINES	SECOND AND THIRD SEGMENTS: ONE ENGINE OPERATING AT MAXIMUM THRUST WITH APR ON. FOURTH SEGMENT: ONE ENGINE OPERATING AT MAXIMUM CONTINUOUS THRUST.
ENGINE BLEED AIR	ALL AIR BLEEDS OFF, SEE NOTE 1 FOR THE EFFECT OF ENGINE ANTI-ICE BLEED.
FLAPS	0°
LANDING GEAR	UP
AIRSPEED	TAKEOFF SAFETY SPEED V_2 (SEE FIGURE PER-10) INCREASING TO V_{FTO} (SEE FIGURE PER-12) AT END OF THIRD SEGMENT.

NOTE

1. TO TAKE ACCOUNT OF ENGINE ANTI-ICE BLEED, ADD 10° C TO THE ACTUAL AIR TEMPERATURE BEFORE ENTERING THE CHART.
2. THE WIND GRID IS FACTORED IN SUCH A WAY THAT AN EFFECT OF NOT MORE THAN 50% OF HEADWINDS AND NOT LESS THAN 150% OF TAILWINDS IS OBTAINED. REPORTED WINDS MAY THEREFORE BE USED DIRECTLY IN THE GRID.

Instructions for Use of Chart

The use of the chart is illustrated by the arrowed broken lines:

- Enter the chart with the air temperature and move up to the appropriate airfield altitude.
- Proceed horizontally to the weight grid reference line and then follow the curve to the appropriate weight.
- Proceed horizontally across to intersect the line on the far right and then downwards to read height at the three-and-a-half-minute point on the bottom scale.

- Proceed upwards from the intersection with the distance curves through the wind correction grid to read distances to the three-and-a-half-minute point, to the achievement of final takeoff climb speed and to 1,500 feet.

- In those cases where the reading on the height scale is at 1,500 feet, the level acceleration (third segment) takes place at 1,500 feet and there is no fourth segment.

NET TAKEOFF FLIGHT PATH FIFTH SEGMENT NET ACCELERATION DISTANCE

Figure PER-58 shows the fifth segment net acceleration distance.

Associated Conditions

Refer to the conditions given in Table PER-18.

Table PER-18. ASSOCIATED CONDITIONS FOR NET TAKEOFF FLIGHT PATH—FIFTH SEGMENT NET ACCELERATION DISTANCE

ENGINES	ONE ENGINE OPERATING AT MAXIMUM CONTINUOUS THRUST
ENGINE BLEED AIR	AIR CONDITIONING BLEED OFF; ANTI-ICE OFF OR ON.
FLAPS	0°
LANDING GEAR	UP
AIRSPEED	V_{FTO} (FIGURE PER-12) INCREASING TO V_{ERC} (FIGURE PER-13) OR TO MINIMUM SPEED FOR USE IN ICING

Instructions for Use of Chart

The use of the chart is illustrated by the arrowed broken lines:

- Obtain fourth segment (final takeoff climb) net gradient from Figure PER-54 allowing for engine anti-ice if necessary.

- Proceed vertically to the appropriate curve and then read distance from the scale at the right.

NET TAKEOFF FLIGHT PATH RADIUS OF STEADY TURN

The minimum radius which may be assumed for a steady turn made during the flight path is shown in Figure PER-59 for flaps 15° and 0°, for varying climb speed, air temperature and mean altitude. The chart is based on a steady 15° banked turn at a given speed.

The total change of heading required is assessed from the airfield obstruction chart; but, if it is less than 15°, no account of the effect of the turn need be taken.

Instructions for Use of Chart

Use of the chart is illustrated by the arrowed broken lines. To determine the radius of steady turn:

- The speed appropriate to the segment and flap setting should be established from the Operating Speeds section or subsection 5.10 of the *AFM* (see Figures PER-8 through PER-13).
- Enter the chart with the speed and move up to the curve.
- Proceed horizontally to the temperature grid reference line.
- Follow the guidelines to the appropriate temperature, and then similarly through the altitude correction grid to obtain radius of steady turn.

NET TAKEOFF FLIGHT PATH HORIZONTAL DISTANCE COVERED IN A STEADY TURN

Figure PER-61 shows the horizontal distance travelled for a given radius of steady turn.

Instructions for Use of Chart

- Enter Figure PER-61 with the radius of steady turn. Proceed vertically to the appropriate change in heading.
- Proceed horizontally to obtain distance covered.

NET TAKEOFF FLIGHT PATH EFFECT OF WIND DURING STEADY TURN

In general when a turn is included in the flight path, there will be a change in wind component. This may be accounted for by the method shown in Figure PER-62 (*AFM* Figure 5.25.9).

Method

The flight path ABCDE is first drawn using the wind component in the take-off direction. It is intended to start a turn at point F, after which the wind component will change:

- From Figure PER-59 obtain the distance covered in the turn and mark point G at the end of the turn.
- Construct a second flight path AHJKL using the wind component after the turn.
- Bisect FG at M and construct the corrected flight path MNOP where MN is parallel to AJ and OP is parallel to KL.
- NO is equal in length to JK and at the same height.
- The end of the turn is then given by point Q at the same distance as G and the complete flight path is given by ABFMQNOP.

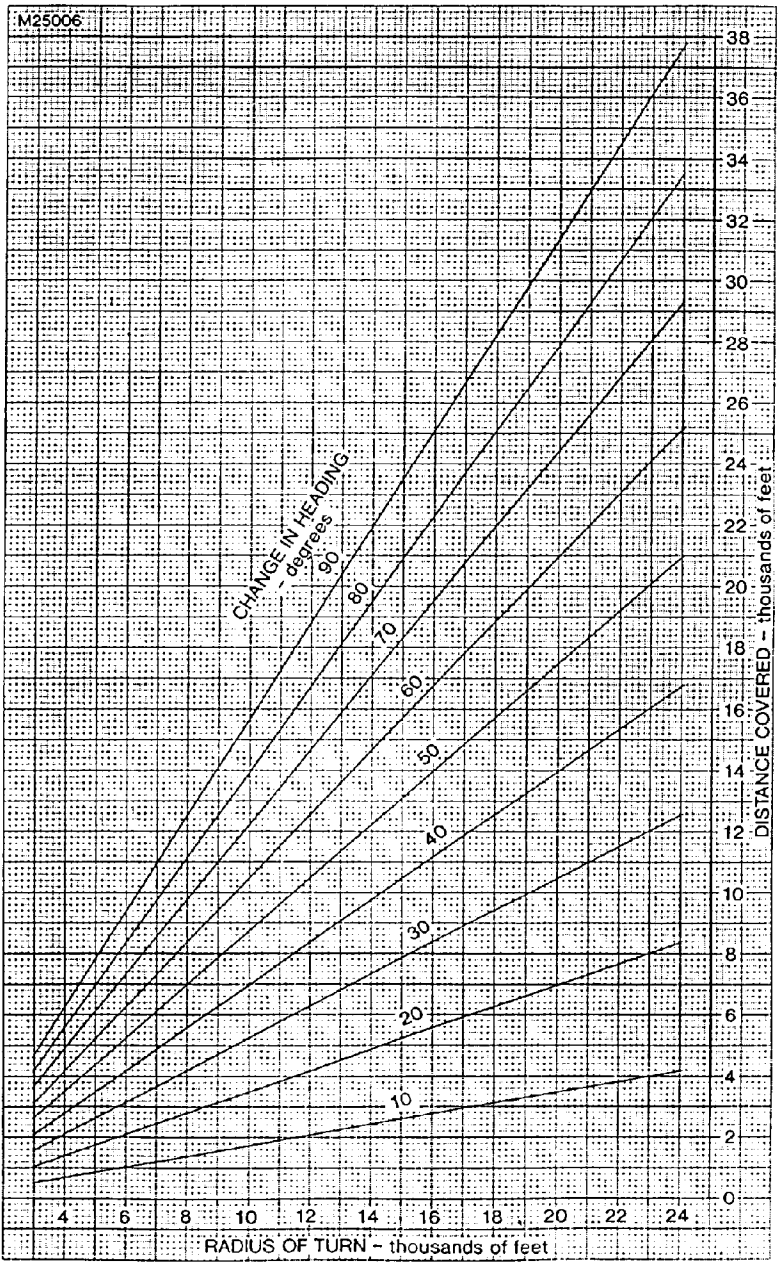


Figure PER-61. Horizontal Distance Covered in a Steady Turn

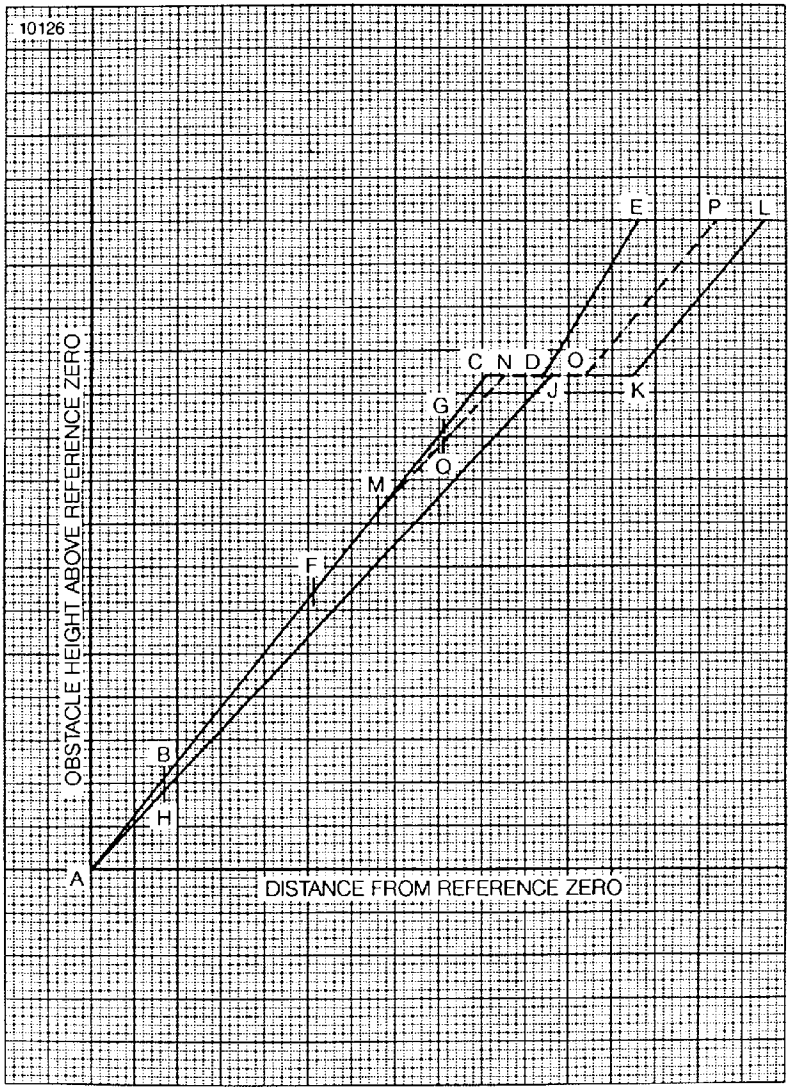


Figure PER-62. Effect of Wind during Steady Turn

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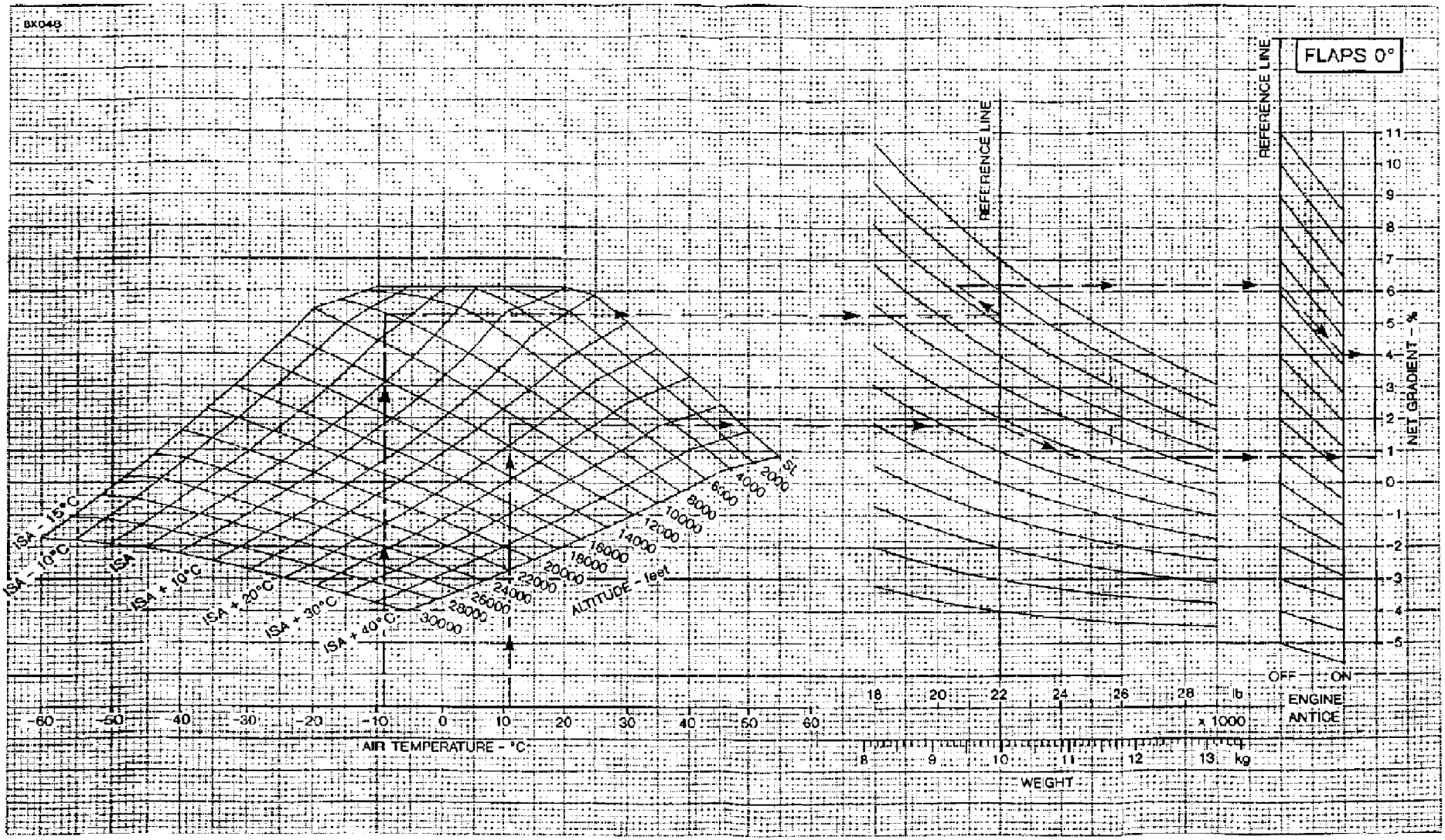


Figure PER-63. Enroute Net Rate of Climb (One Engine Inoperative)

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LANDING WAT DATA

INTRODUCTION

This section contains curves of weights at which for varying altitude and temperature the balked landing and approach climb requirements of FAR 25.119 and 25.121(d) respectively are complied with and at which the energy input to the wheel brakes during a normal landing is within the wheel brake normal capacity.

On Figure PER-63 (*AFM* Figure 5.45.1), the less steep lines on the left of the chart are determined by the approach climb requirement with flaps 15°, landing gear up, and one engine failed. The steep lines on the right of the chart are determined by the wheel brake energy requirement.

MAXIMUM LANDING WEIGHT FOR ALTITUDE AND TEMPERATURE

Instructions for Use of Chart

The use of the graph is illustrated by arrowed broken lines. To determine the landing WAT limit weight:

- Enter from the left with the aerodrome altitude. Move across to the air temperature.
- From the intersection of the air temperature and aerodrome altitude, read the weight on the bottom scale.

NOTE

1. To obtain the effect of engine anti-ice, add 10° C to the actual air temperature before entering the graph.
2. Refer to the Landing Field Length section or subsection 5.50 of the *AFM* (see Figure PER-64) to obtain the maximum weight for landing field length available.

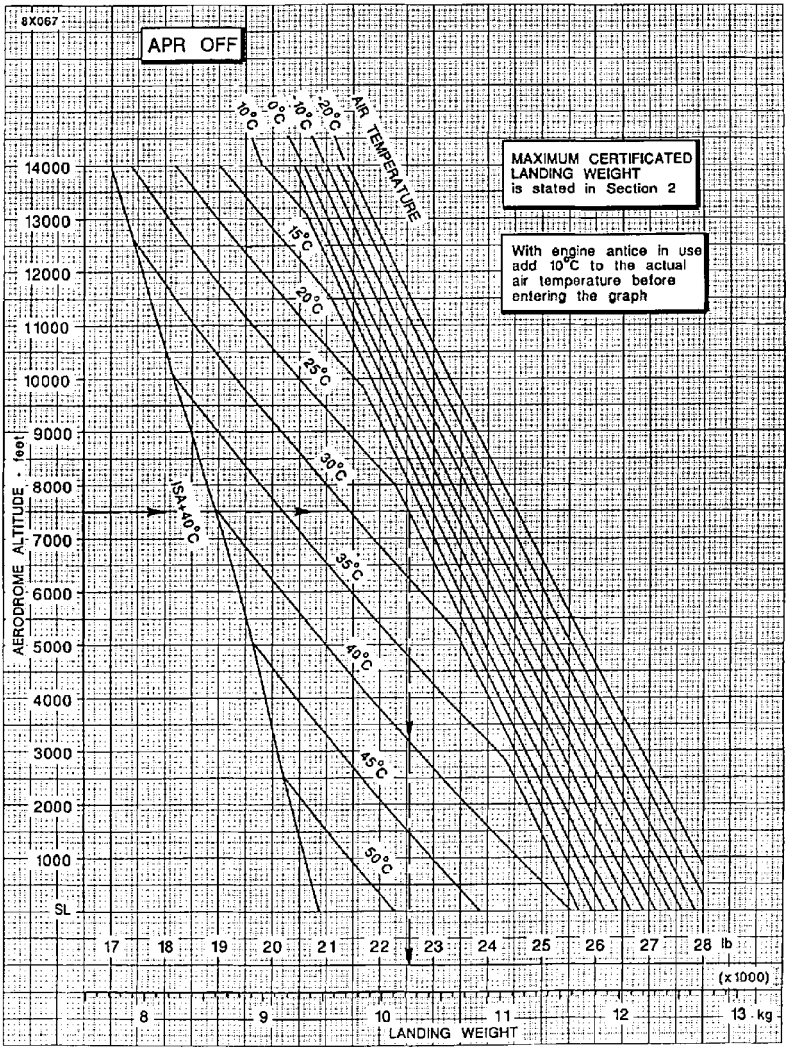


Figure PER-64. Maximum Landing Weight for Altitude and Temperature

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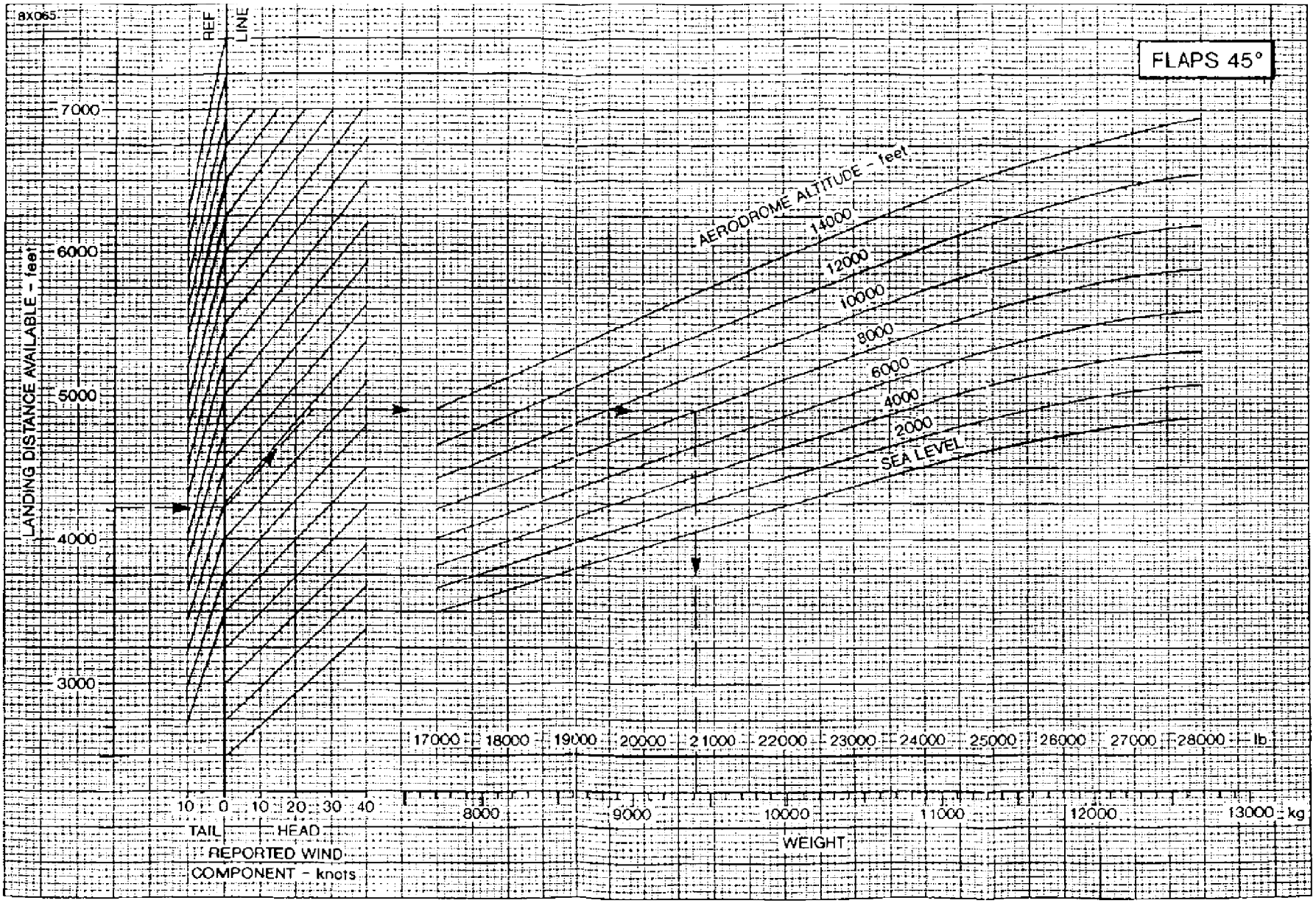


Figure PER-65. Maximum Landing Weight for Landing Distance Available (Flaps 45˚)

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LANDING FIELD LENGTHS

INTRODUCTION

The maximum weight for landing distance available (dry runway factored landing distance) is given on Figure PER-64. The gross landing distance measured in performance tests is equal to 60% of that scheduled in Figure PER-64 (*AFM* Figure 5.50.1).

The maximum weight thus derived will not necessarily be the maximum permissible weight for the landing because the landing WAT curves (see Landing WAT Data section or subsection 5.45 of the *AFM* or see Figure PER-63) might be critical.

MAXIMUM LANDING WEIGHT FOR LANDING DISTANCE AVAILABLE

The maximum landing weight for landing distance available is given for varying aerodrome altitudes and wind components on Figure PER-64 for dry runways only. Figure PER-65 shows the effect of a very slippery runway on landing performance (Table PER-19, Note 3). Table PER-19, Note 6 for landing performance on a wet runway.

Associated Conditions

Refer to the conditions given in Table PER-19.

Table PER-19. ASSOCIATED CONDITIONS FOR LANDING FIELD LENGTHS

ENGINES	THRUST LEVERS CLOSED AT 50 FEET
FLAPS	45°
LANDING GEAR	DOWN
LIFT DUMP	SELECTED AFTER TOUCHDOWN
WHEEL BRAKES	NORMAL SYSTEM SELECTED
AIRSPEED	V_{REF} AT 50 FEET (SEE FIGURE PER-14)

NOTE

1. THE WIND GRID IS FACTORED IN SUCH A WAY THAT THE EFFECT OF NOT MORE THAN 50% OF HEADWINDS AND NOT LESS THAN 150% OF TAILWINDS IS OBTAINED. REPORTED WINDS MAY THEREFORE BE USED DIRECTLY IN THE GRIDS; BUT, WHEN A LANDING IS TO BE MADE INTO A HEADWIND GREATER THAN 40 KNOTS, THE PERFORMANCE APPROPRIATE TO A HEADWIND OF 40 KNOTS IS TO BE OBTAINED FROM THE GRAPH.
2. FIGURE PER-64 IS BASED ON ISA TEMPERATURE CONDITIONS AS REQUIRED BY THE OPERATING REGULATIONS. FOR INFORMATION, LANDING DISTANCE REQUIRED IS INCREASED BY ABOUT 3% FOR EVERY 10° C INCREASE IN TEMPERATURE.
3. FIGURE PER-65 GIVES THE EFFECT ON LANDING DISTANCE OF A VERY SLIPPERY SURFACE HAVING A BRAKING COEFFICIENT OF FRICTION OF 0.05, AND IS INTENDED TO COVER THE EFFECT OF ICY SURFACES AND AQUAPLANING. FIGURE PER-65 IS VALID FOR RUNWAYS WITH APPROXIMATELY ZERO GRADIENT AND WITH NO TAILWIND. LANDING DOWNHILL OR WITH A TAILWIND ON A SLIPPERY RUNWAY SHOULD BE AVOIDED IF POSSIBLE. THE LIMITING COMBINATIONS OF WIND AND GRADIENT FOR WHICH FIGURE PER-65 IS VALID ARE SHOWN ON FIGURE PER-66. COMBINATIONS OF WIND AND GRADIENT LYING IN THE SHADED AREA ARE NOT PERMITTED. NO REDUCTION IN STOPPING DISTANCE IS CREDITED FOR THE USE OF THRUST REVERSERS AND IT IS ASSUMED THAT WHEN THRUST REVERSE IS NOT BEING USED, ONE ENGINE IS SHUT DOWN AFTER TOUCHDOWN TO ASSIST DECELERATION.
4. IF FLAPS 25° IS USED FOR LANDING, REDUCE THE LANDING DISTANCE AVAILABLE BY 10% BEFORE ENTERING FIGURE PER-64.
5. FOR A LANDING WITH FLAPS UP, REDUCE THE LANDING DISTANCE AVAILABLE BY 30% BEFORE ENTERING FIGURE PER-64.
6. FOR WET RUNWAYS, REDUCE THE LANDING DISTANCE AVAILABLE BY 15% BEFORE ENTERING FIGURE PER-64.

Instructions for Use of Charts

The arrowed broken lines illustrate the use of the graphs.

Determining Maximum Landing Weight For Landing

Distance Available on Dry Runway

- Enter Figure PER-64 with the landing distance available and go to the reference line of the wind correction grid and follow the guidelines to the appropriate wind component.
- From here, move horizontally to the appropriate altitude line and thence vertically down to the weight scale.

Determining Maximum Landing Weight For Landing Distance Available on Slippery Runway

- Enter Figure PER-66 (*AFM* Figure 5.50.3) with the runway gradient and reported wind component.
- Combinations of wind and gradient lying in the shaded area are outside of the validity of Figure PER-65 (*AFM* Figure 5.50.2), and are not permitted.
- Reduce the landing distance available to obtain an unfactored landing distance. (For a dry runway, FAR's require unfactored landing distance to be 60% of landing distance available; but there may be occasions when a lower standard of safety is acceptable to the operator and to the Airworthiness Authority.)
- Enter Figure PER-65 with the unfactored landing distance and follow the guidelines to read the equivalent scheduled landing distance available on the right.
- Use this equivalent distance in Figure PER-64 instead of the landing distance available to obtain a landing weight for a slippery runway, with or without the use of lift dump.

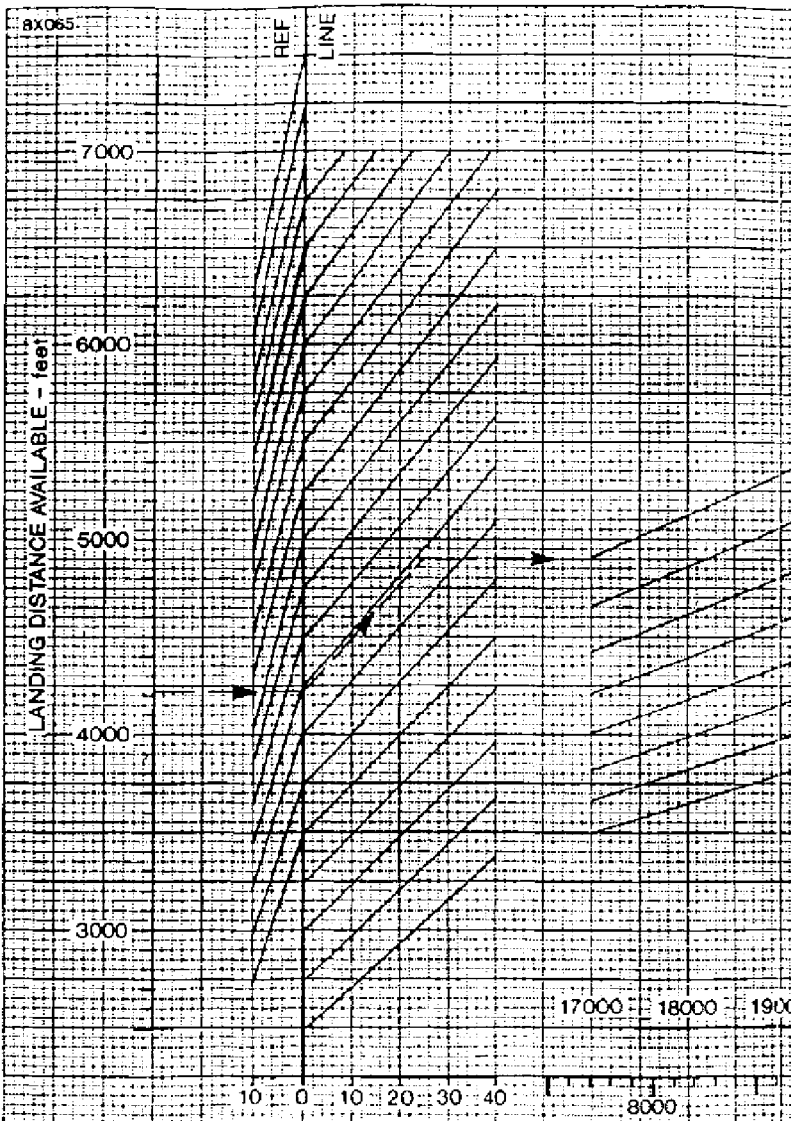


Figure PER-66. Effect of a Slippery Runway on Landing Distance Available

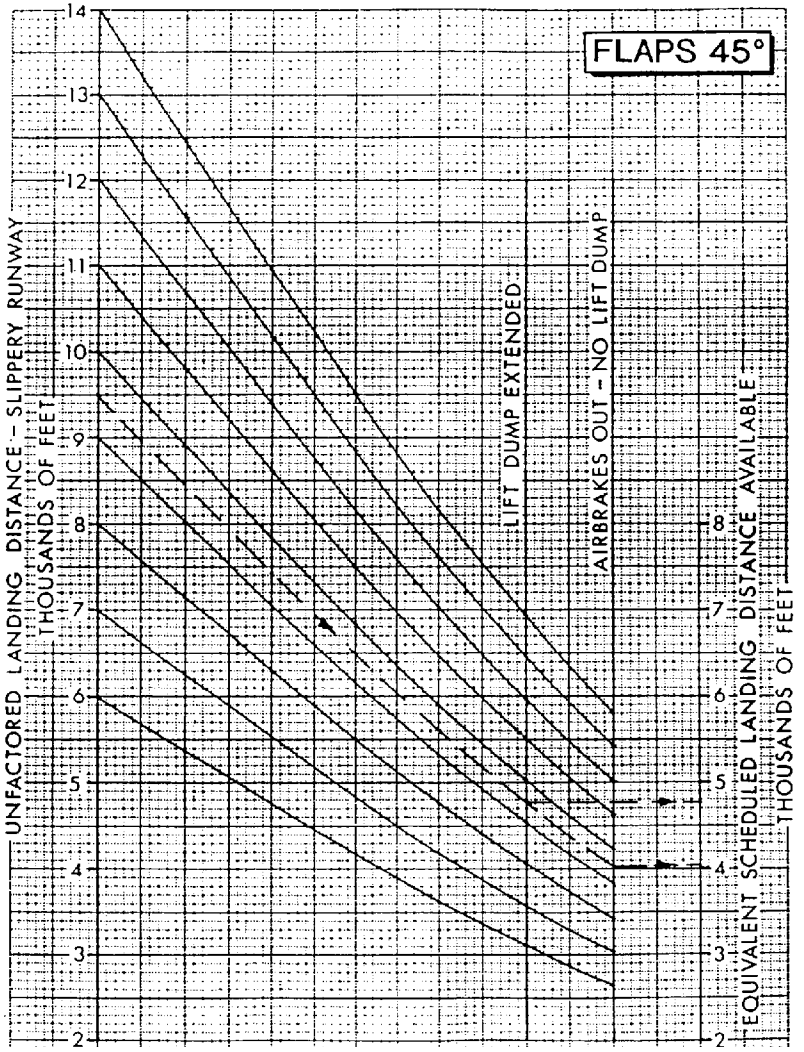


Figure PER-67. Wind and Gradient Restrictions for Landing on Slippery Runway

TABULATED TAKEOFF DATA

INTRODUCTION

This section contains tabulated takeoff information which, for a restricted range of conditions, will allow higher takeoff weights from a given runway length than those given by the charts in the Takeoff Field Length section or subsection 5.20 of the *AFM*.

Except where superseded by Supplement 4, the basic *Approved Flight Manual* limitations and procedures apply. In particular, the limitations on takeoff weight provided by the net takeoff flight path data in subsection 5.25 (*AFM*) must be observed when using the runway length data in this Supplement 4 (*AFM*).

Refer to the basic manual for information not contained herein. Supplement 4 covers changes to Section 2, Limitations (Performance Limitations, Takeoff Field Length) and Section 5, Performance, of the *AFM*.

For Supplement 4, there are no changes to Sections 1, 3, and 4 of the *AFM*.

This tabulated takeoff data in this section replaces the takeoff field length data given in Figures PER-19 to PER-50 and the operating speeds given in Figures PER-8 and PER-10 for the restricted range of conditions listed below.

ASSOCIATED CONDITIONS

The Supplement 4 information only applies under the following conditions:

- Hard, level, dry runway
- No clearway or stopway
- Reported wind component between zero and 10 knots of headwind
- Aerodrome pressure altitude between sea level and 8,000 feet, temperatures (OAT ° C) between 0° C and ISA +35° C or the WAT limit (whichever is lower)
- Nosewheel tire speed limit:
  - 190 mph or 210 mph for flaps 15°
  - 210 mph only for flaps 0°
- APR ON, is defined as APR armed and will automatically increase thrust in the event of an engine failure

USE OF TABULATED TAKEOFF DATA TABLES

1. Select the appropriate table for flap setting and wind speed.

2. Determine the appropriate tables for the aircraft weight (WT lb) and aerodrome altitude ft. For WT lb, aerodrome altitude (ft) and wind speed values which are between the tabulated values use either linear interpolation or the next higher tabulated value.

3. With engine anti-ice ON add 10° C to the actual air temperature before entering the table.

4. For temperatures between the tabulated values use either linear interpolation or the nearest temperature above or below the required temperature, whichever gives the longer distance (Dist ft).

5. Determine the runway distance (Dist ft) required and the takeoff speeds V_1, V_R and V_2 from tabulated values.

6. Of Tables PER-15 through PER-18, those tables which have shaded rows indicate conditions which are brake energy limited (pages PER-159 and PER-177 only).

Table PER-20. FLAPS 15˚, ZERO WIND (SHEET 1 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 190 OR 210 MPH

WT	28,000			27,000			26,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
							33	5840	121 128 133
	27	6230	126 133 139	30	6040	124 130 136	30	5600	120 128 134
2,000	25	6060	126 133 139	25	5630	123 130 137	25	5240	119 128 134
	20	5700	125 133 140	20	5310	122 130 137	20	4950	118 128 135
	15	5420	125 133 140	15	5050	121 130 138	15	4710	118 128 135
	10	5310	125 133 140	10	4950	121 130 138	10	4610	118 128 135
	5	5220	125 133 140	5	4860	121 130 138	5	4540	118 128 135
	0	5130	125 133 140	0	4790	121 130 138	0	4470	118 128 135
							36	5680	121 128 133
	31	6140	127 133 139	33	5870	124 130 136	35	5600	120 128 134
	30	6050	126 133 139	30	5620	123 130 137	30	5230	119 128 134
1,000	25	5650	125 133 140	25	5260	122 130 137	25	4900	118 128 135
	20	5340	125 133 140	20	4980	121 130 138	20	4640	118 128 135
	15	5210	125 133 140	15	4850	121 130 138	15	4530	118 128 135
	10	5120	125 133 140	10	4780	121 130 138	10	4460	118 128 135
	5	5030	125 133 140	5	4700	121 130 138	5	4380	118 128 135
	0	4950	125 133 140	0	4630	121 130 138	0	4310	118 128 135
				37	5800	124 130 136	39	5540	121 128 133
	34	5970	126 133 139	35	5630	123 130 136	35	5230	120 128 134
	30	5640	126 133 139	30	5250	122 130 137	30	4890	119 128 135
SEA LEVEL	25	5280	125 133 140	25	4920	121 130 138	25	4590	118 128 135
	20	5110	125 133 140	20	4760	121 130 138	20	4440	117 128 135
	15	5030	125 133 140	15	4700	121 130 138	15	4380	118 128 135
	10	4940	125 133 140	10	4610	121 130 138	10	4300	118 128 135
	5	4860	125 133 140	5	4530	121 130 138	5	4230	117 128 135
	0	4780	125 133 140	0	4460	121 130 138	0	4160	118 128 135

Table PER-20. FLAPS 15˚, ZERO WIND (SHEET 2 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 190 OR 210 MPH

WT	28,000			27,000			26,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
5,000							21	6150	120 128 134
				17	6350	123 130 136	20	6080	120 128 134
	14	6610	126 133 139	15	6200	123 130 137	15	5760	119 128 134
	10	6300	125 133 139	10	5860	122 130 137	10	5460	119 128 135
	5	5990	125 133 140	5	5580	122 130 137	5	5200	118 128 135
	0	5750	125 133 140	0	5370	121 130 138	0	5000	118 128 136
4,000				22	6250	123 130 136	25	6010	120 128 134
	19	6510	126 133 139	20	6110	123 130 136	20	5670	120 128 134
	15	6200	126 133 139	15	5770	122 130 137	15	5370	119 128 135
	10	5880	125 133 140	10	5480	122 130 137	10	5110	118 128 135
	5	5630	125 133 140	5	5250	121 130 138	5	4900	118 128 136
	0	5520	125 133 140	0	5150	121 130 138	0	4800	118 128 136
3,000				26	6120	123 130 136	29	5910	120 128 134
	23	6350	126 133 139	25	6040	123 130 136	25	5610	120 128 134
	20	6120	126 133 139	20	5690	122 130 137	20	5300	119 128 135
	15	5780	125 133 140	15	5390	122 130 137	15	5020	118 128 135
	10	5520	125 133 140	10	5150	121 130 138	10	4800	118 128 136
	5	5420	125 133 140	5	5050	121 130 138	5	4710	118 128 136
	0	5320	125 133 140	0	4960	121 130 138	0	4630	118 128 136

Table PER-20. FLAPS 15˚, ZERO WIND (SHEET 3 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 190 OR 210 MPH

WT	28,000			27,000			26,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
8,000									
							4	6360	120 128 134
							0	6130	119 128 134
7,000									
							12	6430	120 128 134
				6	6510	123 130 136	10	6280	120 128 134
				5	6440	123 130 136	5	5980	119 128 134
	0	6610	126 133 139	0	6140	122 130 137	0	5720	119 128 135
6,000									
							16	6250	120 128 134
				12	6460	123 130 136	15	6180	120 128 134
	8	6670	126 133 139	10	6310	123 130 137	10	5870	119 128 134
	5	6450	126 133 139	5	6000	122 130 137	5	5580	119 128 135
	0	6150	125 133 139	0	5730	122 130 137	0	5340	118 128 135

Table PER-20. FLAPS 15˚, ZERO WIND (SHEET 4 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 190 OR 210 MPH

WT	25,500			25,000			24,500		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
				36	5610	118 124 130	37	5470	116 123 129
	34	5680	119 126 132	35	5530	117 124 131	35	5320	116 123 129
	27	5380	118 126 133	30	5170	116 124 131	30	4970	115 123 130
2,000	25	5040	117 126 133	25	4850	115 124 132	25	4660	114 123 131
	20	4760	116 126 134	20	4610	115 124 133	20	4570	115 123 131
	15	4530	116 126 134	15	4490	116 124 133	15	4460	116 123 132
	10	4440	116 126 134	10	4400	116 124 133	10	4370	116 123 132
	5	4370	116 126 134	5	4330	116 124 133	5	4300	116 123 132
	0	4300	116 126 134	0	4260	116 124 133	0	4230	116 123 132
	38	5620	119 126 132	39	5470	118 124 130	40	5330	116 123 129
	35	5380	119 126 132	35	5170	117 124 131	35	4970	115 123 130
	30	5020	118 126 133	30	4830	116 124 132	30	4650	114 123 131
1,000	25	4720	117 126 134	25	4540	115 124 132	25	4470	114 123 131
	20	4470	116 126 134	20	4420	116 124 133	20	4390	116 123 132
	15	4360	116 126 134	15	4320	116 124 133	15	4290	116 123 132
	10	4290	116 126 134	10	4250	116 124 133	10	4220	116 123 132
	5	4210	116 126 134	5	4180	116 124 133	5	4150	116 123 132
	0	4150	116 126 134	0	4120	116 124 133	0	4080	116 123 132
	41	5480	119 126 132	42	5340	118 124 130	44	5290	116 123 129
	40	5400	119 126 132	40	5180	117 124 131	40	4980	115 123 130
	35	5030	118 126 133	35	4830	116 124 132	35	4640	114 123 130
	30	5640	126 126 134	30	4530	115 124 132	30	4400	114 123 131
SEA LEVEL	25	5280	125 126 134	25	4360	116 124 133	25	4330	116 123 132
	20	5110	125 126 134	20	4240	116 124 133	20	4210	116 123 132
	15	5030	125 126 134	15	4180	116 124 133	15	4150	116 123 132
	10	4940	125 126 134	10	4110	116 124 133	10	4080	116 123 132
	5	4860	125 126 134	5	4050	116 124 133	5	4020	116 123 132
	0	4780	125 126 134	0	3980	116 124 133	0	3950	116 123 132

Table PER-20. FLAPS 15˚, ZERO WIND (SHEET 5 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 190 OR 210 MPH

WT	25,500			25,000			24,500		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
							27	5860	116 123 129
5,000	23	6050	119 126 132	25	5940	117 124 130	25	5710	116 123 129
	20	5840	118 126 132	20	5610	117 124 131	20	5400	115 123 130
	15	5540	118 126 133	15	5330	116 124 132	15	5120	114 123 130
	10	5250	117 126 134	10	5050	115 124 132	10	4860	113 123 131
	5	5010	116 126 134	5	4820	115 124 132	5	4760	114 123 131
	0	4820	116 126 134	0	4750	116 124 132	0	4720	116 123 132
							31	5780	116 123 129
	27	5920	119 126 132	29	5850	117 124 130	30	5700	116 123 129
4,000	25	5780	119 126 132	25	5550	117 124 131	25	5340	115 123 130
	20	5460	118 126 133	20	5240	116 124 132	20	5040	114 123 130
	15	5170	117 126 134	15	4970	115 124 132	15	4780	113 123 131
	10	4920	116 126 134	10	4780	115 124 133	10	4740	115 123 132
	5	4710	116 126 134	5	4660	116 124 133	5	4620	116 123 132
	0	4620	116 126 134	0	4570	116 124 133	0	4530	116 123 132
	31	5840	119 126 132	32	5690	117 124 131	34	5610	116 123 129
	30	5760	119 126 132	30	5530	117 124 131	30	5310	115 123 130
3,000	25	5390	118 126 133	25	5180	116 124 131	25	4980	114 123 130
	20	5100	117 126 133	20	4900	115 124 132	20	4720	114 123 131
	15	4830	116 126 134	15	4690	115 124 133	15	4650	115 123 132
	10	4620	116 126 134	10	4570	116 124 133	10	4540	116 123 132
	5	4530	116 126 134	5	4490	116 124 133	5	4450	116 123 132
	0	4460	116 126 134	0	4410	116 124 133	0	4380	116 123 132

Table PER-20. FLAPS 15˚, ZERO WIND (SHEET 6 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 190 OR 210 MPH

WT	25,500			25,000			24,500		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
8,000									
				11	6310	117 124 130	13	6190	116 123 129
	9	6440	119 126 132	10	6250	117 124 131	10	6000	115 123 129
	5	6180	118 126 132	5	5940	116 124 131	5	5710	115 123 130
	0	5900	118 126 133	0	5670	116 124 131	0	5460	114 123 130
7,000									
				16	6190	117 124 130	18	6080	116 123 129
	14	6310	119 126 132	15	6120	117 124 131	15	5880	115 123 129
	10	6040	118 126 132	10	5800	116 124 131	10	5580	115 123 130
	5	5750	118 126 133	5	5530	116 124 131	5	5320	114 123 130
	0	5500	117 126 133	0	5290	115 124 132	0	5100	114 123 131
6,000									
				21	6090	117 124 130	23	5980	116 123 129
	19	6210	119 126 132	20	6020	117 124 131	20	5790	115 123 129
	15	5940	118 126 132	15	5710	117 124 131	15	5490	115 123 130
	10	5640	118 126 133	10	5430	116 124 132	10	5220	114 123 130
	5	5370	117 126 133	5	5170	115 124 132	5	4970	114 123 131
	0	5140	117 126 134	0	4940	115 124 132	0	4820	114 123 131

Table PER-20. FLAPS 15˚, ZERO WIND (SHEET 7 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 190 OR 210 MPH

WT	24,000			23,500			23,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
							42	5180	112 118 124
	39	5400	115 121 128	40	5250	113 120 126	40	5020	111 118 125
	35	5110	114 121 128	35	4890	112 120 127	35	4690	110 118 125
	30	4780	113 121 129	30	4580	111 120 128	30	4430	110 118 126
2,000	25	4530	113 121 130	25	4490	113 120 128	25	4450	113 118 127
	20	4540	115 121 130	20	4500	115 120 129	20	4460	115 118 128
	15	4420	116 121 131	15	4390	116 120 129	15	4350	116 118 128
	10	4340	116 121 131	10	4300	116 120 129	10	4270	116 118 128
	5	4260	116 121 131	5	4230	116 120 129	5	4200	116 118 128
	0	4200	116 121 131	0	4160	116 120 129	0	4130	116 118 128
	42	5270	115 121 128	44	5210	113 120 126	45	5060	112 118 124
	40	5120	114 121 128	40	4900	113 120 127	40	4690	111 118 125
	35	4770	113 121 129	35	4580	112 120 127	35	4390	110 118 126
	30	4470	112 121 130	30	4380	112 120 128	30	4340	112 118 127
1,000	25	4430	114 121 130	25	4390	114 120 129	25	4350	114 118 127
	20	4350	116 121 131	20	4320	116 120 129	20	4280	116 118 128
	15	4260	116 121 131	15	4220	116 120 129	15	4190	116 118 128
	10	4190	116 121 131	10	4150	116 120 129	10	4120	116 118 128
	5	4120	116 121 131	5	4090	116 120 129	5	4050	116 118 128
	0	4050	116 121 131	0	4020	116 120 129	0	3990	116 118 128
				47	5100	114 120 126	48	4960	112 118 124
	45	5160	115 121 128	45	4940	113 120 126	45	4730	111 118 125
	40	4780	114 121 128	40	4590	112 120 127	40	4390	110 118 126
	35	4460	113 121 129	35	4280	111 120 128	35	4240	111 118 126
	30	4360	114 121 130	30	4320	114 120 129	30	4280	114 118 127
SEA LEVEL	25	4290	116 121 131	25	4260	116 120 129	25	4220	116 118 128
	20	4180	116 121 131	20	4150	116 120 129	20	4110	116 118 128
	15	4120	116 121 131	15	4080	116 120 129	15	4050	116 118 128
	10	4050	116 121 131	10	4020	116 120 129	10	3990	116 118 128
	5	3980	116 121 131	5	3950	116 120 129	5	3920	116 118 128
	0	3920	116 121 131	0	3890	116 120 129	0	3860	116 118 128

Table PER-20. FLAPS 15˚, ZERO WIND (SHEET 8 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 190 OR 210 MPH

WT	24,000			23,500			23,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
				31	5690	113 120 126	32	5520	111 118 124
	29	5780	115 121 128	30	5610	113 120 126	30	5370	111 118 125
5,000	25	5480	114 121 128	25	5250	112 120 127	25	5030	110 118 125
	20	5190	113 121 129	20	4970	111 120 127	20	4760	109 118 126
	15	4920	112 121 129	15	4750	111 120 128	15	4710	111 118 127
	10	4760	113 121 130	10	4710	113 120 128	10	4670	113 118 127
	5	4720	114 121 130	5	4680	114 120 129	5	4640	114 118 127
	0	4680	116 121 130	0	4640	116 120 129	0	4600	116 118 128
							36	5450	112 118 124
	32	5620	115 121 128	34	5540	113 120 126	35	5370	112 118 124
	30	5470	114 121 128	30	5240	112 120 127	30	5020	111 118 125
4,000	25	5130	113 121 129	25	4910	111 120 127	25	4710	110 118 126
	20	4850	113 121 129	20	4660	111 120 128	20	4620	111 118 126
	15	4710	113 121 130	15	4670	113 120 128	15	4630	113 118 127
	10	4700	115 121 130	10	4660	115 120 129	10	4620	115 118 128
	5	4580	116 121 131	5	4550	116 120 129	5	4510	116 118 128
	0	4500	116 121 131	0	4460	116 120 129	0	4420	116 118 128
	36	5540	115 121 128	37	5380	113 120 126	39	5300	112 118 124
	35	5460	115 121 128	35	5230	113 120 126	35	5010	111 118 125
	30	5100	114 121 128	30	4890	112 120 127	30	4690	110 118 126
3,000	25	4790	113 121 129	25	4600	111 120 128	25	4510	110 118 126
	20	4610	113 121 130	20	4570	113 120 128	20	4530	113 118 127
	15	4610	115 121 130	15	4570	115 120 129	15	4540	115 118 128
	10	4500	116 121 131	10	4460	116 120 129	10	4430	116 118 128
	5	4420	116 121 131	5	4380	116 120 129	5	4350	116 118 128
	0	4340	116 121 131	0	4310	116 120 129	0	4270	116 118 128

Table PER-20. FLAPS 15˚, ZERO WIND (SHEET 9 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 190 OR 210 MPH

WT	24,000			23,500			23,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
8,000									
	16	6140	114 121 128	18	6010	113 120 126	20	5880	111 118 124
	15	6070	114 121 128	15	5820	112 120 126	15	5570	111 118 125
	10	5760	114 121 128	10	5530	112 120 127	10	5300	110 118 125
	5	5490	113 121 129	5	5270	111 120 127	5	5050	109 118 126
	0	5250	113 121 129	0	5040	111 120 127	0	4870	109 118 126
7,000									
				22	5840	113 120 126	25	5790	111 118 124
	20	5960	114 121 128	20	5710	112 120 126	20	5470	111 118 125
	15	5650	114 121 128	15	5420	112 120 127	15	5190	110 118 125
	10	5360	113 121 129	10	5140	111 120 127	10	4930	109 118 126
	5	5120	112 121 129	5	4910	111 120 128	5	4820	110 118 126
	0	4900	112 121 129	0	4840	112 120 128	0	4790	112 118 127
6,000									
				27	5790	113 120 126	29	5690	112 118 124
	25	5890	114 121 128	25	5640	113 120 126	25	5400	111 118 125
	20	5560	114 121 128	20	5330	112 120 127	20	5110	110 118 125
	15	5280	113 121 129	15	5060	111 120 127	15	4850	109 118 126
	10	5020	112 121 129	10	4850	111 120 128	10	4810	111 118 127
	5	4830	112 121 129	5	4780	112 120 128	5	4740	112 118 127
	0	4780	114 121 129	0	4740	114 120 129	0	4700	114 118 127



Table PER-20. FLAPS 15°, ZERO WIND (SHEET 10 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 190 OR 210 MPH

WT	22,500			22,000			21,500		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
				46	5100	110 116 122	46	4890	108 115 121
	44	5140	111 117 123	45	5020	109 116 122	45	4820	108 115 121
	40	4840	110 117 124	40	4650	108 116 123	40	4480	107 115 122
	35	4510	109 117 125	35	4350	107 116 124	35	4260	107 115 123
	30	4390	110 117 125	30	4340	110 116 124	30	4300	110 115 123
2,000	25	4410	113 117 126	25	4370	113 116 125	25	4330	113 115 124
	20	4420	115 117 127	20	4380	115 116 126	20	4340	115 115 125
	15	4310	116 117 127	15	4280	116 116 126	15	4240	116 116 126
	10	4230	116 117 127	10	4200	116 116 126	10	4160	116 116 126
	5	4160	116 117 127	5	4130	116 116 126	5	4100	116 116 126
	0	4100	116 117 127	0	4060	116 116 126	0	4030	116 116 126
	47	5030	111 117 123	48	4910	110 116 122	48	4710	108 115 121
	45	4870	110 117 124	45	4680	109 116 123	45	4500	107 115 122
	40	4520	109 117 124	40	4350	108 116 123	40	4190	106 115 122
	35	4270	109 117 125	35	4230	109 116 124	35	4190	109 115 123
	30	4300	112 117 126	30	4260	112 116 125	30	4220	112 115 124
1,000	25	4310	114 117 127	25	4280	114 116 126	25	4240	114 115 125
	20	4250	116 117 127	20	4210	116 116 126	20	4180	116 116 126
	15	4150	116 117 127	15	4120	116 116 126	15	4090	116 116 126
	10	4090	116 117 127	10	4050	116 116 126	10	4020	116 116 126
	5	4020	116 117 127	5	3990	116 116 126	5	3960	116 116 126
	0	3960	116 117 127	0	3930	116 116 126	0	3890	116 116 126
	50	4920	111 117 123	50	4730	109 116 122	50	4540	108 115 121
	45	4560	110 117 124	45	4380	108 116 123	45	4210	107 115 122
	40	4230	109 117 125	40	4120	108 116 124	40	4080	108 115 123
	35	4200	111 117 126	35	4160	111 116 125	35	4120	111 115 124
	30	4240	114 117 126	30	4210	114 116 126	30	4170	114 115 125
SEA LEVEL	25	4190	116 117 127	25	4150	116 116 126	25	4120	116 116 126
	20	4080	116 117 127	20	4050	116 116 126	20	4020	116 116 126
	15	4020	116 117 127	15	3990	116 116 126	15	3960	116 116 126
	10	3950	116 117 127	10	3920	116 116 126	10	3890	116 116 126
	5	3890	116 117 127	5	3860	116 116 126	5	3830	116 116 126
	0	3830	116 117 127	0	3800	116 116 126	0	3770	116 116 126

Table PER-20. FLAPS 15˚, ZERO WIND (SHEET 11 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 190 OR 210 MPH

WT	22,500			22,000			21,500		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
				36	5400	109 116 122	38	5340	108 115 121
	34	5460	110 117 123	35	5330	109 116 122	35	5120	108 115 121
	30	5170	110 117 124	30	4980	108 116 123	30	4780	107 115 122
5,000	25	4850	109 117 124	25	4660	107 116 124	25	4530	106 115 123
	20	4650	109 117 125	20	4600	109 116 124	20	4560	109 115 123
	15	4660	111 117 126	15	4620	111 116 125	15	4580	111 115 124
	10	4630	113 117 126	10	4590	113 116 125	10	4540	113 115 124
	5	4660	114 117 127	5	4560	114 116 126	5	4520	114 115 125
	0	4560	116 117 127	0	4520	116 116 126	0	4490	116 116 126
							42	5280	108 115 121
	38	5390	111 117 123	39	5260	109 116 122	40	5120	108 115 121
	35	5170	110 117 124	35	4970	109 116 123	35	4770	107 115 122
	30	4830	109 117 124	30	4650	108 116 123	30	4470	106 115 122
4,000	25	4560	108 117 125	25	4510	108 116 124	25	4470	108 115 123
	20	4570	111 117 126	20	4530	111 116 125	20	4490	111 115 124
	15	4580	113 117 126	15	4540	113 116 125	15	4500	113 115 124
	10	4580	115 117 127	10	4540	115 116 126	10	4500	115 115 125
	5	4770	116 117 127	5	4430	116 116 126	5	4400	116 116 126
	0	4390	116 117 127	0	4350	116 116 126	0	4320	116 116 126
	41	5260	111 117 123	43	5210	110 116 122	44	5080	108 115 121
	40	5180	110 117 123	40	4980	109 116 122	40	4790	107 115 121
	35	4820	109 117 124	35	4640	108 116 123	35	4470	106 115 122
	30	4520	108 117 125	30	4410	108 116 124	30	4360	108 115 123
3,000	25	4470	110 117 126	25	4430	110 116 125	25	4390	110 115 124
	20	4490	113 117 126	20	4450	113 116 125	20	4410	113 115 124
	15	4500	115 117 127	15	4460	115 116 126	15	4420	115 115 125
	10	4390	116 117 127	10	4350	116 116 126	10	4320	116 116 126
	5	4310	116 117 127	5	4270	116 116 126	5	4240	116 116 126
	0	4240	116 117 127	0	4200	116 116 126	0	4170	116 116 126

Table PER-20. FLAPS 15°, ZERO WIND (SHEET 12 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 190 OR 210 MPH

WT	22,500			22,000			21,500		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
							28	5750	108 115 121
8,000	23	5840	110 117 123	25	5760	109 116 122	25	5530	107 115 121
	20	5660	110 117 124	20	5400	108 116 123	20	5230	107 115 122
	15	5370	109 117 124	15	5170	108 116 123	15	4960	106 115 122
	10	5100	109 117 125	10	4910	107 116 124	10	4830	107 115 123
	5	4870	108 117 125	5	4820	108 116 124	5	4770	108 115 123
	0	4830	109 117 125	0	4780	109 116 124	0	4740	109 115 123
							31	5570	108 115 121
	27	5720	110 117 123	29	5650	109 116 122	30	5500	108 115 121
7,000	25	5580	110 117 123	25	5360	108 116 122	25	5150	107 115 122
	20	5270	109 117 124	20	5070	108 116 123	20	4870	106 115 122
	15	5000	109 117 125	15	4810	107 116 124	15	4730	107 115 123
	10	4800	108 117 125	10	4750	108 116 124	10	4700	108 115 123
	5	4780	110 117 125	5	4730	110 116 125	5	4680	110 115 123
	0	4750	112 117 126	0	4710	112 116 125	0	4660	112 115 124
	31	5630	110 117 123	33	5560	109 116 122	35	5490	106 115 121
	30	5550	110 117 123	30	5340	109 116 122	30	5120	108 115 121
6,000	25	5200	109 117 124	25	5010	108 116 123	25	4810	110 115 122
	20	4920	109 117 125	20	4730	107 116 124	20	4640	113 115 123
	15	4760	109 117 125	15	4710	109 116 124	15	4660	115 115 123
	10	4760	111 117 126	10	4720	111 116 125	10	4670	116 115 124
	5	4700	112 117 126	5	4660	112 116 125	5	4610	116 115 124
	0	4660	114 117 126	0	4620	114 116 126	0	4580	116 115 124

Table PER-20. FLAPS 15˚, ZERO WIND (SHEET 13 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 190 OR 210 MPH

WT	21,500			20,500			20,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
2,000	46	4690	107 114 120	46	4490	105 112 119	46	4300	103 111 117
	45	4620	106 114 120	45	4420	105 112 119	45	4230	103 111 118
	40	4300	105 114 121	40	4130	104 112 120	40	4080	104 111 118
	35	4220	107 114 122	35	4170	107 112 120	35	4130	107 111 119
	30	4260	110 114 122	30	4220	110 112 121	30	4180	110 111 120
	25	4290	113 114 123	25	4250	113 113 122	25	4210	113 113 122
	20	4300	115 115 125	20	4270	115 115 125	20	4230	115 115 125
	15	4210	116 116 126	15	4170	116 116 126	15	4140	116 116 126
	10	4130	116 116 126	10	4100	116 116 126	10	4060	116 116 126
	5	4060	116 116 126	5	4030	116 116 126	5	4000	116 116 126
	0	4000	116 116 126	0	3970	116 116 126	0	3930	116 116 126
1,000	48	4520	106 114 120	48	4330	105 112 119	48	4140	103 111 117
	45	4320	106 114 121	45	4130	104 112 119	45	3980	103 111 118
	40	4100	106 114 121	40	4050	106 112 120	40	4010	106 111 119
	35	4150	109 114 122	35	4100	109 112 121	35	4060	109 111 120
	30	4180	112 114 123	30	4140	112 112 122	30	4100	112 112 122
	25	4200	114 114 124	25	4160	114 114 124	25	4130	114 114 124
	20	4140	116 116 126	20	4110	116 116 126	20	4070	116 116 126
	15	4050	116 116 126	15	4020	116 116 126	15	3990	116 116 126
	10	3990	116 116 126	10	3960	116 116 126	10	3930	116 116 126
	5	3930	116 116 126	5	3890	116 116 126	5	3860	116 116 126
	0	3860	116 116 126	0	3830	116 116 126	0	3800	116 116 126
SEA LEVEL	50	4360	106 114 120	50	4180	105 112 119	50	3990	103 111 118
	45	4040	105 114 121	45	3950	104 112 120	45	3910	104 111 119
	40	4030	108 114 122	40	3990	108 112 121	40	3950	108 111 120
	35	4080	111 114 123	35	4040	111 112 122	35	4000	111 111 120
	30	4130	114 114 124	30	4090	114 114 124	30	4060	114 114 124
	25	4080	116 116 126	25	4050	116 116 126	25	4020	116 116 126
	20	3980	116 116 126	20	3950	116 116 126	20	3920	116 116 126
	15	3920	116 116 126	15	3890	116 116 126	15	3860	116 116 126
	10	3860	116 116 126	10	3830	116 116 126	10	3800	116 116 126
	5	3800	116 116 126	5	3770	116 116 126	5	3740	116 116 126
	0	3740	116 116 126	0	3710	116 116 126	0	3680	116 116 126

Table PER-20. FLAPS 15˚, ZERO WIND (SHEET 14 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 190 OR 210 MPH

WT	21,500			20,500			20,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
	40	5270	107 114 120	40	5040	105 112 118	40	4820	104 111 117
	35	4910	106 114 120	35	4700	104 112 119	35	4490	103 111 118
	30	4590	105 114 121	30	4420	104 112 120	30	4370	104 111 118
5,000	25	4490	106 114 121	25	4440	106 112 120	25	4390	106 111 119
	20	4510	109 114 122	20	4490	109 112 121	20	4420	109 111 120
	15	4530	111 114 123	15	4170	111 112 122	15	4440	111 111 121
	10	4500	113 114 123	10	4460	113 113 123	10	4420	113 113 123
	5	4480	114 114 124	5	4440	114 114 124	5	4410	114 114 124
	0	4450	116 116 126	0	4410	116 116 126	0	4370	116 116 126
	42	5060	107 114 120	42	4840	105 112 118	42	4630	103 111 117
	40	4920	106 114 120	40	4700	105 112 119	40	4500	103 111 117
	35	4580	105 114 121	35	4400	104 112 119	35	4270	103 111 118
	30	4400	106 114 121	30	4350	106 112 120	30	4310	106 111 119
4,000	25	4420	108 114 122	25	4380	108 112 121	25	4330	108 111 120
	20	4440	111 114 123	20	4400	111 112 122	20	4360	111 111 120
	15	4460	113 114 123	15	4420	113 113 123	15	4380	113 113 123
	10	4460	115 115 125	10	4420	115 115 125	10	4380	115 115 125
	5	4360	116 116 126	5	4320	116 116 126	5	4290	116 116 126
	0	4280	116 116 126	0	4240	116 116 126	0	4210	116 116 126
	44	4870	107 114 120	44	4660	105 112 119	44	4450	103 111 117
	40	4590	106 114 120	40	4390	104 112 119	40	4210	102 111 118
	35	4290	105 114 121	35	4230	105 112 120	35	4190	105 111 119
	30	4320	108 114 122	30	4270	108 112 121	30	4230	108 111 120
3,000	25	4340	110 114 123	25	4300	110 112 121	25	4260	110 111 120
	20	4370	113 114 123	20	4330	113 113 123	20	4290	113 113 123
	15	4380	115 115 125	15	4340	115 115 125	15	4300	115 115 125
	10	4280	116 116 126	10	4250	116 116 126	10	4210	116 116 126
	5	4200	116 116 126	5	4170	116 116 126	5	4140	116 116 126
	0	4140	116 116 126	0	4100	116 116 126	0	4070	116 116 126



Table PER-20. FLAPS 15˚, ZERO WIND (SHEET 15 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 190 OR 210 MPH

WT	21,000			20,500			20,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
				32	5570	105 112 118	34	5480	104 111 116
	30	5670	107 114 119	30	5420	105 112 118	30	5180	103 111 117
8,000	25	5300	106 114 120	25	5080	104 112 119	25	4850	103 111 118
	20	5020	105 114 121	20	4800	104 112 119	20	4670	103 111 118
	15	4780	105 114 121	15	4730	105 112 120	15	4680	105 111 119
	10	4780	107 114 122	10	4730	107 112 120	10	4680	107 111 119
	5	4720	108 114 122	5	4680	108 112 121	5	4630	108 111 120
	0	4690	109 114 122	0	4650	109 112 121	0	4600	109 111 120
				36	5490	106 112 118	36	5240	104 111 117
	33	5500	107 114 120	35	5410	105 112 118	35	5170	104 111 117
	30	5270	106 114 120	30	5040	104 112 119	30	4830	103 111 117
7,000	25	4940	105 114 120	25	4730	104 112 119	25	4560	102 111 118
	20	4680	105 114 121	20	4620	104 112 120	20	4570	104 111 119
	15	4680	107 114 122	15	4640	107 112 120	15	4590	107 111 119
	10	4660	108 114 122	10	4610	108 112 121	10	4560	108 111 120
	5	4640	110 114 122	5	4600	110 112 121	5	4550	110 111 120
	0	4620	112 114 123	0	4580	112 112 122	0	4530	112 112 121
	37	5420	107 114 119	38	5260	105 112 118	38	5030	104 111 117
	35	5270	107 114 120	35	5040	105 112 119	35	4810	103 111 117
	30	4920	106 114 120	30	4710	104 112 119	30	4510	102 111 118
6,000	25	4630	105 114 121	25	4530	104 112 120	25	4480	104 111 119
	20	4590	107 114 122	20	4550	107 112 120	20	4500	107 111 119
	15	4620	109 114 122	15	4570	109 112 121	15	4520	109 111 120
	10	4630	111 114 123	10	4580	111 112 122	10	4540	111 111 121
	5	4570	112 114 123	5	4530	112 112 122	5	4490	112 112 122
	0	4540	114 114 123	0	4500	114 114 123	0	4460	114 114 123



Table PER-20. FLAPS 15˚, ZERO WIND (SHEET 16 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 190 OR 210 MPH

WT	19,500			19,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
2,000	46	4100	101 109 116	46	3960	100 108 115
	45	4040	101 109 117	45	3970	101 108 115
	40	4030	104 109 117	40	3990	104 108 116
	35	4080	107 109 118	35	4040	107 108 117
	30	4130	110 110 119	30	4090	110 110 119
	25	4170	113 113 122	25	4130	113 113 122
	20	4190	115 115 125	20	4160	115 115 125
	15	4110	116 116 126	15	4070	116 116 126
	10	4030	116 116 126	10	4000	116 116 126
	5	3970	116 116 126	5	3940	116 116 126
	0	3900	116 116 126	0	3870	116 116 126
1,000	48	3960	101 109 117	48	3870	101 108 115
	45	3930	103 109 117	45	3890	103 108 116
	40	3970	106 109 118	40	3930	106 108 117
	35	4020	109 109 119	35	3980	109 109 118
	30	4070	112 112 122	30	4030	112 112 122
	25	4090	114 114 124	25	4060	114 114 124
	20	4040	116 116 126	20	4010	116 116 126
	15	3960	116 116 126	15	3930	116 116 126
	10	3900	116 116 126	10	3870	116 116 126
	5	3830	116 116 126	5	3810	116 116 126
	0	3770	116 116 126	0	3750	116 116 126
SEA LEVEL	50	3830	101 109 117	50	3780	101 108 116
	45	3870	104 109 118	45	3830	104 108 116
	40	3910	108 109 118	40	3870	108 108 117
	35	3960	111 111 120	35	3930	111 111 120
	30	4020	114 114 124	30	3990	114 114 124
	25	3980	116 116 126	25	3950	116 116 126
	20	3890	116 116 126	20	3860	116 116 126
	15	3830	116 116 126	15	3800	116 116 126
	10	3770	116 116 126	10	3750	116 116 126
	5	3710	116 116 126	5	3690	116 116 126
	0	3650	116 116 126	0	3620	116 116 126



Table PER-20. FLAPS 15˚, ZERO WIND (SHEET 17 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 190 OR 210 MPH

WT	19,500			19,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
5,000	40	4600	102 109 116	40	4390	100 108 115
	35	4300	101 109 117	35	4250	101 108 116
	30	4320	104 109 117	30	4280	104 108 116
	25	4350	106 109 118	25	4300	106 108 117
	20	4380	109 109 119	20	4330	109 109 118
	15	4400	111 111 121	15	4360	111 111 121
	10	4380	113 113 123	10	4340	113 113 123
	5	4370	114 114 124	5	4330	114 114 124
	0	4340	116 116 126	0	4300	116 116 126
4,000	42	4420	102 109 116	42	4220	100 108 115
	40	4300	101 109 116	40	4140	100 108 115
	35	4220	103 109 117	35	4170	103 108 116
	30	4260	106 109 118	30	4220	106 108 117
	25	4290	108 109 119	25	4250	108 108 118
	20	4320	111 111 120	20	4280	111 111 120
	15	4340	113 113 123	15	4300	113 113 123
	10	4340	115 115 125	10	4310	115 115 125
	5	4250	116 116 126	5	4220	116 116 126
	0	4180	116 116 126	0	4140	116 116 126
3,000	44	4260	102 109 116	44	4060	100 108 115
	40	4110	102 109 117	40	4060	102 108 116
	35	4140	105 109 118	35	4100	105 108 117
	30	4190	108 109 118	30	4150	108 108 117
	25	4220	110 110 120	25	4180	110 110 120
	20	4250	113 113 123	20	4210	113 113 123
	15	4270	115 115 125	15	4230	115 115 125
	10	4180	116 116 126	10	4150	116 116 126
	5	4100	116 116 126	5	4070	116 116 126
	0	4040	116 116 126	0	4000	116 116 126

Table PER-20. FLAPS 15°, ZERO WIND (SHEET 18 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 190 OR 210 MPH

WT	19,500			19,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
	34	5230	102 109 115	34	4990	101 108 114
	30	4950	102 109 116	30	4720	100 108 115
8,000	25	4650	101 109 116	25	4560	100 108 115
	20	4620	103 109 117	20	4570	103 108 116
	15	4620	105 109 118	15	4580	105 108 116
	10	4630	107 109 118	10	4590	107 108 117
	5	4580	108 109 119	5	4540	108 108 117
	0	4560	109 109 119	0	4510	109 109 119
	36	5000	102 109 116	36	4770	101 108 114
	35	4930	102 109 116	35	4710	100 108 115
	30	4610	101 109 116	30	4450	100 108 115
7,000	25	4510	102 109 117	25	4460	102 108 116
	20	4520	104 109 118	20	4470	104 108 117
	15	4540	107 109 118	15	4490	107 108 117
	10	4520	108 109 119	10	4470	108 108 118
	5	4510	110 110 120	5	4470	110 110 120
	0	4490	112 112 121	0	4450	112 112 121
	38	4800	102 109 116	38	4580	100 108 115
	35	4600	103 109 116	35	4390	100 108 115
	30	4420	102 109 117	30	4370	102 108 116
6,000	25	4430	104 109 118	25	4380	104 108 116
	20	4450	107 109 118	20	4410	107 108 117
	15	4480	109 109 119	15	4430	109 109 118
	10	4490	111 111 121	10	4450	111 111 121
	5	4450	112 112 122	5	4410	112 112 122
	0	4420	114 114 123	0	4380	114 114 123

Table PER-21. FLAPS 15˚, 10 KT HEADWIND (SHEET 1 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 190 OR 210 MPH

WT	28,000			27,000			26,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
							33	5470	120 128 134
	27	5860	125 133 139	30	5670	123 130 136	30	5230	119 128 134
2,000	25	5690	125 133 139	25	5260	122 130 137	25	4890	118 128 135
	20	5320	124 133 140	20	4960	121 130 137	20	4620	117 128 135
	15	5070	124 133 140	15	4730	120 130 138	15	4410	117 128 136
	10	4970	124 133 140	10	4640	121 130 138	10	4320	117 128 136
	5	4890	124 133 140	5	4560	121 130 138	5	4240	117 128 136
	0	4800	124 133 140	0	4490	121 130 138	0	4180	117 128 136
							36	5320	120 128 134
	31	5780	126 133 139	33	5510	123 130 136	35	5240	119 128 134
	30	5690	125 133 139	30	5260	122 130 137	30	4870	119 128 135
1,000	25	5280	124 133 140	25	4910	121 130 137	25	4570	118 128 135
	20	4990	124 133 140	20	4660	121 130 138	20	4340	117 128 136
	15	4880	124 133 140	15	4550	121 130 138	15	4230	117 128 136
	10	4790	124 133 140	10	4480	121 130 138	10	4170	117 128 136
	5	4710	124 133 140	5	4400	121 130 138	5	4100	117 128 136
	0	4640	124 133 140	0	4330	121 130 138	0	4040	117 128 136
				37	5450	123 130 136	39	5180	120 128 134
	34	5620	125 133 139	35	5270	122 130 137	35	4860	119 128 134
	30	5290	125 133 139	30	4900	121 130 137	30	4560	118 128 135
SEA LEVEL	25	4930	124 133 140	25	4600	121 130 138	25	4290	117 128 136
	20	4780	124 133 140	20	4460	121 130 138	20	4160	117 128 136
	15	4710	124 133 140	15	4400	121 130 138	15	4100	117 128 136
	10	4630	124 133 140	10	4330	121 130 138	10	4050	117 128 136
	5	4560	124 133 140	5	4260	121 130 138	5	3970	117 128 136
	0	4480	124 133 140	0	4200	121 130 138	0	3920	117 128 136



Table PER-21. FLAPS 15˚, 10 KT HEADWIND (SHEET 2 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 190 OR 210 MPH

WT	28,000			27,000			26,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
5,000							21	5760	119 128 134
				17	5950	122 130 136	20	5690	119 128 134
	14	6200	125 133 139	15	5810	122 130 137	15	5380	119 128 134
	10	5900	124 133 139	10	5480	121 130 137	10	5100	118 128 135
	5	5600	124 133 140	5	5220	121 130 137	5	4860	117 128 135
	0	5380	124 133 140	0	5020	120 130 138	0	4670	117 128 136
4,000				22	5870	122 130 136	25	5630	119 128 134
	19	6110	125 133 139	20	5720	122 130 136	20	5300	119 128 134
	15	5810	125 133 139	15	5400	121 130 137	15	5020	118 128 135
	10	5490	124 133 140	10	5120	121 130 137	10	4770	117 128 135
	5	5270	124 133 140	5	4910	120 130 138	5	4570	117 128 136
	0	5160	124 133 140	0	4820	120 130 138	0	4480	117 128 136
3,000				26	5750	122 130 136	29	5540	119 128 134
	23	5960	125 133 139	25	5670	122 130 136	25	5230	119 128 134
	20	5740	125 133 139	20	5310	122 130 137	20	4940	118 128 135
	15	5400	124 133 140	15	5030	121 130 137	15	4690	117 128 135
	10	5170	124 133 140	10	4820	120 130 138	10	4490	117 128 136
	5	5070	124 133 140	5	4730	121 130 138	5	4400	117 128 136
	0	4980	124 133 140	0	4650	121 130 138	0	4330	117 128 136

Table PER-21. FLAPS 15˚, 10 KT HEADWIND (SHEET 3 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 190 OR 210 MPH

WT	28,000			27,000			26,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
8,000									
							4	5950	119 128 134
							0	5740	119 128 134
7,000									
							12	6430	120 128 134
				6	6090	122 130 136	10	5870	119 128 134
				5	6020	122 130 136	5	5590	119 128 134
	0	6190	125 133 139	0	5750	121 130 137	0	5350	118 128 135
6,000									
							16	5850	119 128 134
				12	6050	122 130 136	15	5780	119 128 134
	8	6240	125 133 139	10	5910	122 130 137	10	5480	119 128 134
	5	6030	125 133 139	5	5600	121 130 137	5	5220	118 128 135
	0	5750	124 133 139	0	5360	121 130 137	0	4990	117 128 135

Table PER-21. FLAPS 15˚, 10 KT HEADWIND (SHEET 4 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 190 OR 210 MPH

WT	25,500			25,000			24,500		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
				36	5250	117 124 130	37	5100	115 123 129
	34	5320	118 126 132	35	5170	116 124 131	35	4950	115 123 129
	27	5010	117 126 133	30	4820	116 124 131	30	4630	114 123 130
2,000	25	4700	117 126 133	25	4520	115 124 132	25	4340	113 123 131
	20	4440	116 126 134	20	4360	115 124 133	20	4320	115 123 131
	15	4270	116 126 134	15	4240	116 124 133	15	4210	116 123 132
	10	4190	116 126 134	10	4160	116 124 133	10	4130	116 123 132
	5	4120	116 126 134	5	4090	116 124 133	5	4060	116 123 132
	0	4050	116 126 134	0	4010	116 124 133	0	3990	116 123 132
	38	5260	118 126 132	39	5110	117 124 130	40	4980	115 123 129
	35	5020	118 126 132	35	4810	116 124 131	35	4620	114 123 130
	30	4680	117 126 133	30	4500	115 124 132	30	4320	113 123 131
1,000	25	4390	116 126 134	25	4250	114 124 132	25	4220	114 123 131
	20	4200	116 126 134	20	4170	116 124 133	20	4140	116 123 132
	15	4110	116 126 134	15	4080	116 124 133	15	4050	116 123 132
	10	4040	116 126 134	10	4010	116 124 133	10	3980	116 123 132
	5	3970	116 126 134	5	3940	116 124 133	5	3910	116 123 132
	0	3910	116 126 134	0	3880	116 124 133	0	3850	116 123 132
	41	5130	118 126 132	42	4990	117 124 130	44	4950	115 123 129
	40	5050	118 126 132	40	4830	116 124 131	40	4630	115 123 130
	35	4680	117 126 133	35	4490	115 124 132	35	4320	114 123 130
	30	4380	116 126 134	30	4210	114 124 132	30	4150	114 123 131
SEA LEVEL	25	4150	116 126 134	25	4120	116 124 133	25	4080	116 123 132
	20	4030	116 126 134	20	4000	116 124 133	20	3970	116 123 132
	15	3970	116 126 134	15	3940	116 124 133	15	3910	116 123 132
	10	3910	116 126 134	10	3880	116 124 133	10	3850	116 123 132
	5	3840	116 126 134	5	3810	116 124 133	5	3780	116 123 132
	0	3780	116 126 134	0	3750	116 124 133	0	3720	116 123 132

Table PER-21. FLAPS 15˚, 10 KT HEADWIND (SHEET 5 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 190 OR 210 MPH

WT	25,500			25,000			24,500		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
							27	5480	115 123 129
5,000	23	5650	118 126 132	25	5550	116 124 130	25	5320	115 123 129
	20	5450	117 126 132	20	5240	116 124 131	20	5040	114 123 130
	15	5170	117 126 133	15	4970	115 124 132	15	4780	113 123 130
	10	4910	116 126 134	10	4720	114 124 132	10	4540	113 123 131
	5	4670	116 126 134	5	4540	114 124 132	5	4510	114 123 131
	0	4530	116 126 134	0	4500	116 124 132	0	4460	116 123 132
							31	5400	115 123 129
	27	5540	118 126 132	29	5470	117 124 130	30	5320	115 123 129
4,000	25	5390	118 126 132	25	5180	116 124 131	25	4970	114 123 130
	20	5090	117 126 133	20	4890	115 124 132	20	4710	114 123 130
	15	4830	116 126 134	15	4640	115 124 132	15	4490	113 123 131
	10	4590	116 126 134	10	4520	115 124 133	10	4480	115 123 132
	5	4440	116 126 134	5	4400	116 124 133	5	4370	116 123 132
	0	4350	116 126 134	0	4320	116 124 133	0	4290	116 123 132
	31	5470	118 126 132	32	5310	116 124 131	34	5240	115 123 129
	30	5390	118 126 132	30	5160	116 124 131	30	4950	114 123 130
3,000	25	5030	117 126 133	25	4830	115 124 131	25	4640	114 123 130
	20	4750	116 126 133	20	4570	115 124 132	20	4400	113 123 131
	15	4510	116 126 134	15	4430	115 124 133	15	4400	115 123 132
	10	4350	116 126 134	10	4320	116 124 133	10	4290	116 123 132
	5	4270	116 126 134	5	4240	116 124 133	5	4210	116 123 132
	0	4200	116 126 134	0	4170	116 124 133	0	4130	116 123 132



Table PER-21. FLAPS 15˚, 10 KT HEADWIND (SHEET 6 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 190 OR 210 MPH

WT	25,500			25,000			24,500		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
8,000									
				11	5900	116 124 130	13	5780	115 123 129
	9	6020	118 126 132	10	5840	116 124 131	10	5610	114 123 129
	5	5780	117 126 132	5	5550	116 124 131	5	5340	114 123 130
	0	5520	117 126 133	0	5300	115 124 131	0	5100	113 123 130
7,000									
				16	6190	117 124 130	18	5670	115 123 129
	14	5900	118 126 132	15	5720	116 124 131	15	5490	114 123 129
	10	5640	117 126 132	10	5420	115 124 131	10	5210	114 123 130
	5	5380	117 126 133	5	5170	115 124 131	5	4970	113 123 130
	0	5140	116 126 133	0	4940	115 124 132	0	4750	113 123 131
6,000									
				21	5690	116 124 130	23	5580	115 123 129
	19	5810	118 126 132	20	5620	116 124 131	20	5400	115 123 129
	15	5550	117 126 132	15	5330	116 124 131	15	5120	114 123 130
	10	5270	117 126 133	10	5070	115 124 132	10	4880	113 123 130
	5	5020	116 126 133	5	4830	114 124 132	5	4640	113 123 131
	0	4800	116 126 134	0	4610	114 124 132	0	4560	114 123 131

Table PER-21. FLAPS 15˚, 10 KT HEADWIND (SHEET 7 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 190 OR 210 MPH

WT	24,000			23,500			23,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
							42	4820	111 118 124
	39	5040	114 121 128	40	4890	112 120 126	40	4670	110 118 125
	35	4750	113 121 128	35	4550	111 120 127	35	4360	110 118 125
	30	4450	112 121 129	30	4260	110 120 128	30	4180	110 118 126
2,000	25	4280	113 121 130	25	4240	113 120 128	25	4200	113 118 127
	20	4290	115 121 130	20	4250	115 120 129	20	4210	115 118 128
	15	4180	116 121 131	15	4140	116 120 129	15	4110	116 118 128
	10	4100	116 121 131	10	4060	116 120 129	10	4030	116 118 128
	5	4030	116 121 131	5	3990	116 120 129	5	3960	116 118 128
	0	3960	116 121 131	0	3930	116 120 129	0	3900	116 118 128
	42	4920	114 121 128	44	4860	112 120 126	45	4710	111 118 124
	40	4760	113 121 128	40	4560	112 120 127	40	4360	110 118 125
	35	4440	113 121 129	35	4250	111 120 127	35	4080	109 118 126
	30	4170	112 121 130	30	4130	112 120 128	30	4100	112 118 127
1,000	25	4180	114 121 130	25	4140	114 120 129	25	4110	114 118 127
	20	4110	116 121 131	20	4080	116 120 129	20	4040	116 118 128
	15	4020	116 121 131	15	3980	116 120 129	15	3950	116 118 128
	10	3950	116 121 131	10	3920	116 120 129	10	3890	116 118 128
	5	3880	116 121 131	5	3850	116 120 129	5	3820	116 118 128
	0	3820	116 121 131	0	3790	116 120 129	0	3760	116 118 128
				47	4760	113 120 126	48	4620	111 118 124
	45	4810	114 121 128	45	4600	112 120 126	45	4390	110 118 125
	40	4440	113 121 128	40	4260	111 120 127	40	4080	109 118 126
	35	4150	112 121 129	35	4030	111 120 128	35	3990	111 118 126
	30	4110	114 121 130	30	4080	114 120 129	30	4040	114 118 127
SEA LEVEL	25	4050	116 121 131	25	4020	116 120 129	25	3990	116 118 128
	20	3950	116 121 131	20	3910	116 120 129	20	3880	116 118 128
	15	3880	116 121 131	15	3850	116 120 129	15	3820	116 118 128
	10	3820	116 121 131	10	3790	116 120 129	10	3760	116 118 128
	5	3750	116 121 131	5	3720	116 120 129	5	3700	116 118 128
	0	3690	116 121 131	0	3660	116 120 129	0	3640	116 118 128



Table PER-21. FLAPS 15˚, 10 KT HEADWIND (SHEET 8 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 190 OR 210 MPH

WT	24,000			23,500			23,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
				31	5320	112 120 126	32	5150	111 118 124
	29	5400	114 121 128	30	5230	112 120 126	30	5000	110 118 125
5,000	25	5110	113 121 128	25	4900	111 120 127	25	4690	109 118 125
	20	4840	112 121 129	20	4640	111 120 127	20	4440	109 118 126
	15	4600	112 121 129	15	4490	111 120 128	15	4450	111 118 127
	10	4500	113 121 130	10	4460	113 120 128	10	4420	113 118 127
	5	4470	114 121 130	5	4430	114 120 129	5	4390	114 118 127
	0	4430	116 121 130	0	4390	116 120 129	0	4350	116 118 128
							36	5080	111 118 124
	32	5250	114 121 128	34	5160	112 120 126	35	5000	111 118 124
	30	5100	113 121 128	30	4880	112 120 127	30	4670	110 118 125
4,000	25	4780	113 121 129	25	4580	111 120 127	25	4390	109 118 126
	20	4520	112 121 129	20	4400	111 120 128	20	4360	111 118 126
	15	4450	113 121 130	15	4410	113 120 128	15	4370	113 118 127
	10	4440	115 121 130	10	4400	115 120 129	10	4370	115 118 128
	5	4330	116 121 131	5	4300	116 120 129	5	4260	116 118 128
	0	4250	116 121 131	0	4220	116 120 129	0	4180	116 118 128
	36	5180	114 121 128	37	5020	112 120 126	39	4940	111 118 124
	35	5090	114 121 128	35	4870	112 120 126	35	4660	110 118 125
	30	4750	113 121 128	30	4560	111 120 127	30	4360	109 118 126
3,000	25	4460	112 121 129	25	4300	110 120 128	25	4260	110 118 126
	20	4360	113 121 130	20	4320	113 120 128	20	4280	113 118 127
	15	4360	115 121 130	15	4320	115 120 129	15	4290	115 118 128
	10	4250	116 121 131	10	4220	116 120 129	10	4190	116 118 128
	5	4170	116 121 131	5	4140	116 120 129	5	4110	116 118 128
	0	4100	116 121 131	0	4070	116 120 129	0	4040	116 118 128

Table PER-21. FLAPS 15˚, 10 KT HEADWIND (SHEET 9 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 190 OR 210 MPH

WT	24,000			23,500			23,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
8,000									
	16	5730	113 121 128	18	5600	112 120 126	20	5480	110 118 124
	15	5670	113 121 128	15	5430	112 120 126	15	5200	110 118 125
	10	5380	113 121 128	10	5160	111 120 127	10	4940	109 118 125
	5	5130	112 121 129	5	4920	110 120 127	5	4710	109 118 126
	0	4900	112 121 129	0	4700	110 120 127	0	4610	109 118 126
7,000									
				22	5450	112 120 126	25	5400	110 118 124
	20	5560	113 121 128	20	5330	112 120 126	20	5100	110 118 125
	15	5280	113 121 128	15	5060	111 120 127	15	4850	109 118 125
	10	5010	112 121 129	10	4800	110 120 127	10	4600	109 118 126
	5	4780	112 121 129	5	4600	110 120 128	5	4560	110 118 126
	0	4620	112 121 129	0	4580	112 120 128	0	4530	112 118 127
6,000									
				27	5400	112 120 126	29	5300	111 118 124
	25	5490	113 121 128	25	5260	112 120 126	25	5030	110 118 125
	20	5180	113 121 128	20	4970	111 120 127	20	4760	109 118 125
	15	4930	112 121 129	15	4720	111 120 127	15	4540	109 118 126
	10	4690	112 121 129	10	4590	111 120 128	10	4550	111 118 127
	5	4570	112 121 129	5	4530	112 120 128	5	4490	112 118 127
	0	4520	114 121 129	0	4490	114 120 129	0	4450	114 118 127

Table PER-21. FLAPS 15˚, 10 KT HEADWIND (SHEET 10 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 190 OR 210 MPH

WT	22,500			22,000			21,500		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
				46	4750	109 116 122	46	4540	107 115 121
	44	4790	110 117 123	45	4660	109 116 122	45	4470	107 115 121
	40	4490	109 117 124	40	4320	108 116 123	40	4150	106 115 122
	35	4200	108 117 125	35	4050	107 116 124	35	4010	107 115 123
	30	4140	110 117 125	30	4100	110 116 124	30	4060	110 115 123
2,000	25	4160	113 117 126	25	4120	113 116 125	25	4090	113 115 124
	20	4180	115 117 127	20	4140	115 116 126	20	4100	115 115 125
	15	4080	116 117 127	15	4040	116 116 126	15	4010	116 116 126
	10	4000	116 117 127	10	3970	116 116 126	10	3930	116 116 126
	5	3930	116 117 127	5	3900	116 116 126	5	3870	116 116 126
	0	3860	116 117 127	0	3830	116 116 126	0	3800	116 116 126
	47	4680	110 117 123	48	4570	109 116 122	48	4370	107 115 121
	45	4520	109 117 124	45	4350	108 116 123	45	4170	106 115 122
	40	4200	108 117 124	40	4040	107 116 123	40	3900	106 115 122
	35	4020	109 117 125	35	3980	109 116 124	35	3940	109 115 123
	30	4060	112 117 126	30	4020	112 116 125	30	3980	112 115 124
1,000	25	4070	114 117 127	25	4040	114 116 126	25	4000	114 115 125
	20	4010	116 117 127	20	3980	116 116 126	20	3950	116 116 126
	15	3920	116 117 127	15	3890	116 116 126	15	3860	116 116 126
	10	3860	116 117 127	10	3830	116 116 126	10	3800	116 116 126
	5	3790	116 117 127	5	3760	116 116 126	5	3730	116 116 126
	0	3730	116 117 127	0	3700	116 116 126	0	3670	116 116 126
				50	4390	109 116 122	50	4210	107 115 121
	45	4220	109 117 124	45	4060	107 116 123	45	3910	106 115 122
	40	3930	108 117 125	40	3870	108 116 124	40	3840	108 115 123
	35	3960	111 117 126	35	3920	111 116 125	35	3880	111 115 124
	30	4000	114 117 126	30	3970	114 116 126	30	3930	114 115 125
SEA LEVEL	25	3950	116 117 127	25	3920	116 116 126	25	3890	116 116 126
	20	3850	116 117 127	20	3820	116 116 126	20	3790	116 116 126
	15	3790	116 117 127	15	3760	116 116 126	15	3730	116 116 126
	10	3730	116 117 127	10	3700	116 116 126	10	3670	116 116 126
	5	3670	116 117 127	5	3640	116 116 126	5	3610	116 116 126
	0	3610	116 117 127	0	3580	116 116 126	0	3550	116 116 126

Table PER-21. FLAPS 15˚, 10 KT HEADWIND (SHEET 11 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 190 OR 210 MPH

WT	22,500			22,000			21,500		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
				36	5030	108 116 122	38	4970	107 115 121
	34	5090	110 117 123	35	4960	108 116 122	35	4760	107 115 121
	30	4820	109 117 124	30	4630	107 116 123	30	4450	106 115 122
5,000	25	4520	108 117 124	25	4350	107 116 124	25	4280	106 115 123
	20	4390	109 117 125	20	4350	109 116 124	20	4310	109 115 123
	15	4410	111 117 126	15	4370	111 116 125	15	4330	111 115 124
	10	4380	113 117 126	10	4340	113 116 125	10	4300	113 115 124
	5	4350	114 117 127	5	4320	114 116 126	5	4280	114 115 125
	0	4320	116 117 127	0	4280	116 116 126	0	4250	116 116 126
							42	4920	107 115 121
	38	5030	110 117 123	39	4900	108 116 122	40	4760	107 115 121
	35	4810	109 117 124	35	4620	108 116 123	35	4440	106 115 122
	30	4500	108 117 124	30	4330	107 116 123	30	4190	106 115 122
4,000	25	4300	108 117 125	25	4260	108 116 124	25	4220	108 115 123
	20	4320	111 117 126	20	4280	111 116 125	20	4240	111 115 124
	15	4330	113 117 126	15	4300	113 116 125	15	4260	113 115 124
	10	4330	115 117 127	10	4290	115 116 126	10	4250	115 115 125
	5	4230	116 117 127	5	4190	116 116 126	5	4160	116 116 126
	0	4150	116 117 127	0	4120	116 116 126	0	4080	116 116 126
	41	4900	110 117 123	43	4850	109 116 122	44	4720	107 115 121
	40	4820	110 117 123	40	4630	108 116 122	40	4440	107 115 121
	35	4490	109 117 124	35	4320	107 116 123	35	4140	106 115 122
	30	4200	108 117 125	30	4160	108 116 124	30	4120	108 115 123
3,000	25	4220	110 117 126	25	4180	110 116 125	25	4140	110 115 124
	20	4240	113 117 126	20	4200	113 116 125	20	4170	113 115 124
	15	4250	115 117 127	15	4210	115 116 126	15	4180	115 115 125
	10	4150	116 117 127	10	4120	116 116 126	10	4080	116 116 126
	5	4070	116 117 127	5	4040	116 116 126	5	4010	116 116 126
	0	4000	116 117 127	0	3970	116 116 126	0	3940	116 116 126

Table PER-21. FLAPS 15˚, 10 KT HEADWIND (SHEET 12 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 190 OR 210 MPH

WT	22,500			22,000			21,500		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
							28	5360	107 115 121
8,000	23	5450	109 117 123	25	5370	108 116 122	25	5150	107 115 121
	20	5280	109 117 124	20	5080	108 116 123	20	4870	106 115 122
	15	5010	108 117 124	15	4820	107 116 123	15	4630	105 115 122
	10	4760	108 117 125	10	4620	107 116 124	10	4570	107 115 123
	5	4600	108 117 125	5	4560	108 116 124	5	4510	108 115 123
	0	4570	109 117 125	0	4520	109 116 124	0	4480	109 115 123
							31	5570	108 115 121
	27	5330	109 117 123	29	5260	108 116 122	30	5120	107 115 121
7,000	25	5200	109 117 123	25	5000	108 116 122	25	4800	106 115 122
	20	4910	108 117 124	20	4730	107 116 123	20	4540	105 115 122
	15	4670	108 117 125	15	4520	107 116 124	15	4470	107 115 123
	10	4530	108 117 125	10	4490	108 116 124	10	4450	108 115 123
	5	4520	110 117 125	5	4470	110 116 125	5	4430	110 115 123
	0	4490	112 117 126	0	4450	112 116 125	0	4410	112 115 124
	31	5250	110 117 123	33	5180	108 116 122	35	5110	107 115 121
	30	5550	110 117 123	30	4970	108 116 122	30	4780	106 115 121
6,000	25	4850	109 117 124	25	4660	107 116 123	25	4480	106 115 122
	20	4590	108 117 125	20	4430	107 116 124	20	4380	107 115 123
	15	4500	109 117 125	15	4450	109 116 124	15	4410	109 115 123
	10	4500	111 117 126	10	4460	111 116 125	10	4420	111 115 124
	5	4440	112 117 126	5	4400	112 116 125	5	4360	112 115 124
	0	4410	114 117 126	0	4370	114 116 126	0	4330	114 115 124

Table PER-21. FLAPS 15˚, 10 KT HEADWIND (SHEET 13 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 190 OR 210 MPH

WT	21,000			20,500			20,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
2,000	46	4350	106 114 120	46	4160	104 112 119	46	3980	102 111 117
	45	4290	105 114 120	45	4100	104 112 119	45	3920	102 111 118
	40	3990	104 114 121	40	3880	104 112 120	40	3840	104 111 118
	35	3970	107 114 122	35	3930	107 112 120	35	3890	107 111 119
	30	4020	110 114 122	30	3980	110 112 121	30	3940	110 111 120
	25	4050	113 114 123	25	4010	113 113 122	25	3970	113 113 122
	20	4070	115 115 125	20	4030	115 115 125	20	4000	115 115 125
	15	3980	116 116 126	15	3950	116 116 126	15	3910	116 116 126
	10	3900	116 116 126	10	3870	116 116 126	10	3840	116 116 126
	5	3840	116 116 126	5	3810	116 116 126	5	3780	116 116 126
	0	3770	116 116 126	0	3740	116 116 126	0	3710	116 116 126
1,000	48	4190	106 114 120	48	4010	104 112 119	48	3840	102 111 117
	45	4010	105 114 121	45	3840	103 112 119	45	3740	103 111 118
	40	3860	106 114 121	40	3820	106 112 120	40	3780	106 111 119
	35	3910	109 114 122	35	3870	109 112 121	35	3830	109 111 120
	30	3950	112 114 123	30	3910	112 112 122	30	3870	112 112 122
	25	3970	114 114 124	25	3930	114 114 124	25	3900	114 114 124
	20	3910	116 116 126	20	3880	116 116 126	20	3850	116 116 126
	15	3830	116 116 126	15	3800	116 116 126	15	3770	116 116 126
	10	3770	116 116 126	10	3740	116 116 126	10	3710	116 116 126
	5	3700	116 116 126	5	3680	116 116 126	5	3650	116 116 126
	0	3640	116 116 126	0	3620	116 116 126	0	3590	116 116 126
SEA LEVEL	50	4040	106 114 120	50	3870	104 112 119	50	3700	102 111 118
	45	3760	104 114 121	45	3720	104 112 120	45	3680	104 111 119
	40	3800	108 114 122	40	3760	108 112 121	40	3720	108 111 120
	35	3850	111 114 123	35	3810	111 112 122	35	3770	111 111 120
	30	3900	114 114 124	30	3860	114 114 124	30	3830	114 114 124
	25	3860	116 116 126	25	3830	116 116 126	25	3790	116 116 126
	20	3760	116 116 126	20	3730	116 116 126	20	3700	116 116 126
	15	3700	116 116 126	15	3670	116 116 126	15	3650	116 116 126
	10	3640	116 116 126	10	3610	116 116 126	10	3590	116 116 126
	5	3580	116 116 126	5	3550	116 116 126	5	3530	116 116 126
	0	3520	116 116 126	0	3500	116 116 126	0	3470	116 116 126



Table PER-21. FLAPS 15˚, 10 KT HEADWIND (SHEET 14 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 190 OR 210 MPH

WT	21,000			20,500			20,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
	40	4900	106 114 120	40	4680	104 112 118	40	4480	103 111 117
	35	4560	105 114 120	35	4360	104 112 119	35	4170	102 111 118
	30	4270	104 114 121	30	4170	104 112 120	30	4120	104 111 118
5,000	25	4230	106 114 121	25	4190	106 112 120	25	4150	106 111 119
	20	4270	109 114 122	20	4220	109 112 121	20	4180	109 111 120
	15	4290	111 114 123	15	4240	111 112 122	15	4200	111 111 121
	10	4260	113 114 123	10	4220	113 113 123	10	4180	113 113 123
	5	4240	114 114 124	5	4210	114 114 124	5	4170	114 114 124
	0	4210	116 116 126	0	4180	116 116 126	0	4140	116 116 126
	42	5060	107 114 120	42	4490	104 112 118	42	4300	103 111 117
	40	4570	106 114 120	40	4370	104 112 119	40	4180	102 111 117
	35	4260	105 114 121	35	4080	103 112 119	35	4020	103 111 118
	30	4150	106 114 121	30	4110	106 112 120	30	4060	106 111 119
4,000	25	4180	108 114 122	25	4130	108 112 121	25	4090	108 111 120
	20	4200	111 114 123	20	4160	111 112 122	20	4120	111 111 120
	15	4220	113 114 123	15	4180	113 113 123	15	4140	113 113 123
	10	4220	115 115 125	10	4180	115 115 125	10	4150	115 115 125
	5	4130	116 116 126	5	4090	116 116 126	5	4060	116 116 126
	0	4050	116 116 126	0	4020	116 116 126	0	3980	116 116 126
	44	4520	106 114 120	44	4320	104 112 119	44	4130	103 111 117
	40	4260	105 114 120	40	4080	103 112 119	40	3910	102 111 118
	35	4030	105 114 121	35	3990	105 112 120	35	3940	105 111 119
	30	4070	108 114 122	30	4030	108 112 121	30	3990	108 111 120
3,000	25	4100	110 114 123	25	4060	110 112 121	25	4020	110 111 120
	20	4130	113 114 123	20	4090	113 113 123	20	4050	113 113 123
	15	4140	115 115 125	15	4110	115 115 125	15	4070	115 115 125
	10	4050	116 116 126	10	4020	116 116 126	10	3980	116 116 126
	5	3970	116 116 126	5	3940	116 116 126	5	3910	116 116 126
	0	3910	116 116 126	0	3880	116 116 126	0	3850	116 116 126

Table PER-21. FLAPS 15˚, 10 KT HEADWIND (SHEET 15 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 190 OR 210 MPH

WT	21,000			20,500			20,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
				32	5190	105 112 118	34	5090	103 111 116
	30	5280	106 114 119	30	5050	104 112 118	30	4820	103 111 117
8,000	25	4940	105 114 120	25	4730	103 112 119	25	4520	102 111 118
	20	4680	105 114 121	20	4480	103 112 119	20	4410	103 111 118
	15	4520	105 114 121	15	4470	105 112 120	15	4420	105 111 119
	10	4520	107 114 122	10	4480	107 112 120	10	4430	107 111 119
	5	4470	108 114 122	5	4420	108 112 121	5	4380	108 111 120
	0	4440	109 114 122	0	4400	109 112 121	0	4350	109 111 120
				36	5110	105 112 118	36	4870	103 111 117
	33	5110	106 114 120	35	5030	105 112 118	35	4810	103 111 117
	30	4910	105 114 120	30	4700	104 112 119	30	4490	102 111 117
7,000	25	4610	105 114 120	25	4410	103 112 119	25	4300	102 111 118
	20	4410	104 114 121	20	4360	104 112 120	20	4320	104 111 119
	15	4430	107 114 122	15	4380	107 112 120	15	4340	107 111 119
	10	4400	108 114 122	10	4360	108 112 121	10	4320	108 111 120
	5	4390	110 114 122	5	4350	110 112 121	5	4310	110 111 120
	0	4370	112 114 123	0	4330	112 112 122	0	4290	112 112 121
	37	5040	106 114 119	38	4890	105 112 118	38	4670	103 111 117
	35	4900	106 114 120	35	4690	104 112 119	35	4480	102 111 117
	30	4580	105 114 120	30	4390	103 112 119	30	4210	102 111 118
6,000	25	4320	104 114 121	25	4270	104 112 120	25	4220	104 111 119
	20	4340	107 114 122	20	4290	107 112 120	20	4250	107 111 119
	15	4360	109 114 122	15	4320	109 112 121	15	4280	109 111 120
	10	4380	111 114 123	10	4330	111 112 122	10	4290	111 111 121
	5	4330	112 114 123	5	4290	112 112 122	5	4250	112 112 122
	0	4290	114 114 123	0	4260	114 114 123	0	4220	114 114 123

Table PER-21. FLAPS 15˚, 10 KT HEADWIND (SHEET 16 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 190 OR 210 MPH

WT	19,500			19,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
2,000	46	3800	101 109 116	46	3720	100 108 115
	45	3770	101 109 117	45	3730	101 108 115
	40	3800	104 109 117	40	3760	104 108 116
	35	3850	107 109 118	35	3810	107 108 117
	30	3900	110 110 119	30	3860	110 110 119
	25	3940	113 113 122	25	3900	113 113 122
	20	3960	115 115 125	20	3930	115 115 125
	15	3880	116 116 126	15	3850	116 116 126
	10	3810	116 116 126	10	3780	116 116 126
	5	3750	116 116 126	5	3720	116 116 126
	0	3690	116 116 126	0	3660	116 116 126
1,000	48	3680	101 109 117	48	3640	101 108 115
	45	3690	103 109 117	45	3650	103 108 116
	40	3740	106 109 118	40	3700	106 108 117
	35	3790	109 109 119	35	3750	109 109 118
	30	3840	112 112 122	30	3800	112 112 122
	25	3870	114 114 124	25	3830	114 114 124
	20	3820	116 116 126	20	3790	116 116 126
	15	3740	116 116 126	15	3710	116 116 126
	10	3680	116 116 126	10	3650	116 116 126
	5	3620	116 116 126	5	3590	116 116 126
	0	3560	116 116 126	0	3530	116 116 126
SEA LEVEL	50	3590	101 109 117	50	3550	101 108 116
	45	3640	104 109 118	45	3600	104 108 116
	40	3680	108 109 118	40	3650	108 108 117
	35	3740	111 111 120	35	3700	111 111 120
	30	3800	114 114 124	30	3760	114 114 124
	25	3760	116 116 126	25	3730	116 116 126
	20	3670	116 116 126	20	3650	116 116 126
	15	3620	116 116 126	15	3590	116 116 126
	10	3560	116 116 126	10	3540	116 116 126
	5	3500	116 116 126	5	3480	116 116 126
	0	3440	116 116 126	0	3410	116 116 126

Table PER-21. FLAPS 15˚, 10 KT HEADWIND (SHEET 17 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 190 OR 210 MPH

WT	19,500			19,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
	40	4280	101 109 116	40	4080	99 108 115
	35	4050	101 109 117	35	4000	101 108 116
	30	4080	104 109 117	30	4040	104 108 116
5,000	25	4100	106 109 118	25	4060	106 108 117
	20	4140	109 109 119	20	4100	109 109 118
	15	4160	111 111 121	15	4130	111 111 121
	10	4150	113 113 123	10	4110	113 113 123
	5	4140	114 114 124	5	4100	114 114 124
	0	4110	116 116 126	0	4080	116 116 126
	42	4110	101 109 116	42	3920	99 108 115
	40	3990	101 109 116	40	3900	100 108 115
	35	3970	103 109 117	35	3930	103 108 116
	30	4020	106 109 118	30	3980	106 108 117
4,000	25	4050	108 109 119	25	4010	108 108 118
	20	4080	111 111 120	20	4040	111 111 120
	15	4100	113 113 123	15	4070	113 113 123
	10	4110	115 115 125	10	4080	115 115 125
	5	4030	116 116 126	5	3990	116 116 126
	0	3950	116 116 126	0	3920	116 116 126
	44	3950	101 109 116	44	3800	99 108 115
	40	3870	102 109 117	40	3820	102 108 116
	35	3900	105 109 118	35	3860	105 108 117
	30	3950	108 109 118	30	3910	108 108 117
3,000	25	3980	110 110 120	25	3950	110 110 120
	20	4020	113 113 123	20	3980	113 113 123
	15	4040	115 115 125	15	4000	115 115 125
	10	3950	116 116 126	10	3920	116 116 126
	5	3880	116 116 126	5	3850	116 116 126
	0	3820	116 116 126	0	3790	116 116 126



Table PER-21. FLAPS 15˚, 10 KT HEADWIND (SHEET 18 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 190 OR 210 MPH

WT	19,500			19,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
	34	4860	102 109 115	34	4640	100 108 114
	30	4610	101 109 116	30	4400	99 108 115
8,000	25	4350	100 109 116	25	4300	100 108 115
	20	4360	103 109 117	20	4310	103 108 116
	15	4370	105 109 118	15	4330	105 108 116
	10	4380	107 109 118	10	4340	107 108 117
	5	4340	108 109 119	5	4300	108 108 117
	0	4310	109 109 119	0	4270	109 109 119
	36	4650	101 109 116	36	4440	100 108 114
	35	4600	101 109 116	35	4380	100 108 115
	30	4290	100 109 116	30	4190	100 108 115
7,000	25	4260	102 109 117	25	4210	102 108 116
	20	4270	104 109 118	20	4220	104 108 117
	15	4290	107 109 118	15	4250	107 108 117
	10	4270	108 109 119	10	4230	108 108 118
	5	4270	110 110 120	5	4230	110 110 120
	0	4250	112 112 121	0	4220	112 112 121
	38	4460	101 109 116	38	4250	100 108 115
	35	4280	101 109 116	35	4090	99 108 115
	30	4160	102 109 117	30	4120	102 108 116
6,000	25	4180	104 109 118	25	4130	104 108 116
	20	4210	107 109 118	20	4160	107 108 117
	15	4230	109 109 119	15	4190	109 109 118
	10	4250	111 111 121	10	4210	111 111 121
	5	4210	112 112 122	5	4170	112 112 122
	0	4180	114 114 123	0	4150	114 114 123

Table PER-22. FLAPS 0˚, ZERO WIND (SHEET 1 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 210 MPH

WT	28,000			27,000			26,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
							42	8290	136 142 144
	36	8450	139 145 148	39	8450	138 144 147	40	7480	131 137 140
	35	8030	136 142 146	35	7330	133 139 142	35	6840	130 136 140
	30	7210	134 140 144	30	6730	131 138 142	30	6280	128 136 140
2,000	25	6630	132 140 144	25	6190	129 137 142	25	5780	126 135 140
	20	6150	130 139 144	20	5760	128 137 142	20	5400	125 135 140
	15	5820	130 139 144	15	5460	127 137 142	15	5120	124 135 140
	10	5710	130 139 144	10	5350	127 137 142	10	5020	124 135 140
	5	5600	130 139 144	5	5260	127 137 142	5	4930	124 135 140
	0	5510	130 139 144	0	5170	127 137 142	0	4850	124 135 140
				42	8120	137 143 145	45	8030	135 141 143
	39	8120	138 144 147	40	7370	133 139 142	40	6890	130 136 140
	35	7220	134 140 144	35	6750	132 138 142	35	6300	128 136 140
	30	6620	132 140 144	30	6190	130 137 142	30	5770	127 135 140
1,000	25	6100	131 139 144	25	5710	128 137 142	25	5350	125 135 140
	20	5720	130 139 144	20	5370	127 137 142	20	5040	124 134 140
	15	5580	130 139 144	15	5240	127 137 142	15	4910	124 134 140
	10	5490	130 139 144	10	5150	127 137 142	10	4830	124 134 140
	5	5390	130 139 144	5	5060	127 137 142	5	4750	124 134 140
	0	5300	130 139 144	0	4980	127 137 142	0	4670	124 134 140
							47	7440	133 139 141
	42	7860	138 143 146	45	7950	137 143 145	45	6970	131 136 140
	40	7260	134 140 144	40	6790	132 138 142	40	6340	129 136 140
	35	6640	133 139 144	35	6200	130 137 142	35	5780	127 135 140
	30	6100	131 139 144	30	5700	128 137 142	30	5340	125 134 140
SEA LEVEL	25	5650	130 139 144	25	5300	127 136 142	25	4970	124 134 140
	20	5460	130 139 144	20	5120	127 136 142	20	4810	124 134 140
	15	5380	130 139 144	15	5050	127 136 142	15	4740	124 134 140
	10	5280	130 139 144	10	4960	127 136 142	10	4660	124 134 140
	5	5190	130 139 144	5	4880	127 136 142	5	4580	124 134 140
	0	5100	130 139 144	0	4800	127 136 142	0	4510	124 134 140

Table PER-22. FLAPS 0˚, ZERO WIND (SHEET 2 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 210 MPH

WT	28,000			27,000			26,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
							32	8790	135 141 143
	26	9210	139 145 149	29	9070	138 144 147	30	8080	132 138 140
5,000	25	8790	137 143 147	25	7970	133 139 142	25	7430	130 137 140
	20	7960	134 141 144	20	7420	132 139 142	20	6920	129 137 140
	15	7430	133 140 144	15	6940	131 138 142	15	6460	127 136 140
	10	6960	132 140 144	10	6490	129 138 142	10	6050	126 136 140
	5	6540	131 140 144	5	6110	128 137 142	5	5730	125 135 140
	0	6230	130 139 144	0	5840	128 137 142	0	5480	125 135 140
							36	8930	137 143 146
				32	8650	137 143 145	35	8440	135 140 143
	29	8720	138 144 148	30	7960	133 139 142	30	7420	131 137 140
4,000	25	7850	134 141 144	25	7330	132 139 142	25	6830	129 136 140
	20	7300	133 140 144	20	6820	131 138 142	20	6350	127 136 140
	15	6810	132 140 144	15	6350	129 138 142	15	5940	126 135 140
	10	6380	131 139 144	10	5970	128 137 142	10	5590	125 135 140
	5	6090	130 139 144	5	5700	128 137 142	5	5350	124 135 140
	0	5960	130 139 144	0	5590	128 137 142	0	5240	124 135 140
				36	8780	139 145 147	39	8560	136 142 145
	33	8790	139 145 149	35	8290	136 142 145	35	7440	131 137 140
	30	7830	135 141 144	30	7320	132 139 142	30	6830	129 136 140
3,000	25	7210	133 140 144	25	6740	131 138 142	25	6280	128 136 140
	20	6710	132 140 144	20	6260	129 138 142	20	5850	126 135 140
	15	6250	130 139 144	15	5860	128 137 142	15	5490	125 135 140
	10	5950	130 139 144	10	5580	127 137 142	10	5230	124 135 140
	5	5830	130 139 144	5	5470	127 137 142	5	5130	124 135 140
	0	5730	130 139 144	0	5380	127 137 142	0	5040	124 135 140

Table PER-22. FLAPS 0˚, ZERO WIND (SHEET 3 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 210 MPH

WT	28,000			27,000			26,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
8,000							22	10130	139 144 148
				18	12620	137 147 151	20	9310	135 141 144
	14	13950	135 148 152	15	9230	136 142 145	15	8370	131 138 141
	10	9100	135 142 146	10	8440	133 140 143	10	7850	130 137 141
	5	8520	135 141 145	5	7940	132 139 143	5	7390	129 137 141
	0	8050	134 141 145	0	7500	131 139 143	0	6980	128 137 141
7,000							26	9780	138 144 147
				22	10140	138 146 149	25	9320	136 142 144
	18	11340	136 147 150	20	9100	136 142 145	20	8210	131 138 141
	15	8880	136 142 146	15	8250	133 140 143	15	7680	130 137 141
	10	8290	134 141 145	10	7730	132 139 143	10	7200	129 137 141
	5	7800	134 141 145	5	7270	131 139 143	5	6770	128 136 141
	0	7370	133 141 145	0	6870	130 138 143	0	6390	127 136 141
6,000				26	9620	139 145 149	29	9230	136 142 145
	22	9650	138 146 149	25	9170	137 143 146	25	8100	131 138 141
	20	8780	136 142 146	20	8090	133 139 143	20	7540	130 137 141
	15	8110	134 141 145	15	7560	132 139 143	15	7050	129 137 141
	10	7600	133 141 145	10	7080	131 139 143	10	6600	128 136 141
	5	7140	132 140 145	5	6660	130 138 143	5	6210	126 136 141
	0	6750	131 140 145	0	6290	129 138 143	0	5900	126 136 141

Table PER-22. FLAPS 0˚, ZERO WIND (SHEET 4 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 210 MPH

WT	25,000			24,500			24,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
				46	7680	130 136 138	46	7080	126 132 135
	45	8050	133 139 141	45	7270	128 133 136	45	6950	126 132 135
	40	6900	128 134 137	40	6610	126 133 136	40	6320	124 131 135
	35	6310	126 133 137	35	6030	124 132 136	35	5770	122 130 135
	30	5780	124 133 137	30	5550	122 131 136	30	5320	120 130 135
2,000	25	5350	123 132 137	25	5140	121 131 136	25	4930	119 129 135
	20	5000	121 132 137	20	4810	119 130 136	20	4610	117 128 135
	15	4750	120 131 137	15	4560	118 130 136	15	4370	116 128 135
	10	4650	120 131 137	10	4470	118 130 136	10	4290	116 128 135
	5	4750	120 131 137	5	4390	118 130 136	5	4210	116 128 135
	0	4500	120 131 137	0	4320	118 130 136	0	4140	116 128 135
	48	7890	133 139 141	48	7110	128 133 136	48	6780	126 131 134
	45	6980	128 134 137	45	6680	127 133 136	45	6390	125 131 134
	40	6350	127 133 137	40	6070	125 132 136	40	5810	123 130 134
	35	5790	125 133 137	35	5560	123 131 136	35	5330	121 130 134
	30	5340	123 132 137	30	5130	121 131 136	30	4920	119 129 134
1,000	25	4950	121 131 137	25	4760	119 130 136	25	4570	117 128 134
	20	4670	120 131 137	20	4480	118 130 136	20	4300	116 128 134
	15	4550	120 131 137	15	4370	118 130 136	15	4190	116 128 134
	10	4480	120 131 137	10	4300	118 130 136	10	4130	116 128 134
	5	4400	120 131 137	5	4230	118 130 136	5	4060	116 128 134
	0	4330	120 131 137	0	4160	118 130 136	0	4000	116 128 134
	50	7300	131 136 139	50	6780	127 133 136	50	6490	125 131 134
	45	6430	127 134 137	45	6150	125 132 136	45	5880	123 130 134
	40	5840	125 133 137	40	5590	123 131 136	40	5350	121 130 134
	35	5350	123 132 137	35	5130	122 131 136	35	4920	120 129 134
	30	4940	122 131 137	30	4750	120 130 136	30	4550	118 128 134
SEA LEVEL	25	4610	120 131 137	25	4420	118 129 136	25	4240	116 128 134
	20	4460	120 131 137	20	4280	118 129 136	20	4100	116 128 134
	15	4390	120 131 137	15	4210	118 129 136	15	4050	116 128 134
	10	4320	120 131 137	10	4140	118 129 136	10	3990	116 128 134
	5	4240	120 131 137	5	4070	118 129 136	5	3900	116 128 134
	0	4180	120 131 137	0	4010	118 129 136	0	3880	116 128 134

Table PER-22. FLAPS 0˚, ZERO WIND (SHEET 5 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 210 MPH

WT	25,000			24,500			24,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
	36	8970	135 141 143	37	8520	132 137 139	39	8550	131 137 139
	35	8460	132 138 140	35	7770	128 134 136	35	7440	126 132 135
	30	7450	128 135 138	30	7140	126 133 136	30	6830	124 132 135
5,000	25	6850	127 134 138	25	6560	125 133 136	25	6270	123 131 135
	20	6370	125 134 138	20	6090	123 132 136	20	5850	121 130 135
	15	5960	124 133 138	15	5720	122 132 136	15	5490	120 130 135
	10	5610	123 133 138	10	5390	121 131 136	10	5170	119 129 135
	5	5310	122 132 138	5	5100	120 131 136	5	4900	118 129 135
	0	5080	121 132 138	0	4880	119 130 136	0	4680	117 129 135
							42	8240	131 136 139
	39	8610	134 140 142	40	8190	131 137 139	40	7480	126 132 135
	35	7460	129 135 138	35	7150	127 133 136	35	6840	125 132 135
	30	6840	127 134 138	30	6550	125 132 136	30	6260	123 131 135
4,000	25	6290	125 133 138	25	6020	123 132 136	25	5770	121 130 135
	20	5860	124 133 138	20	5630	122 131 136	20	5390	120 130 135
	15	5500	122 132 138	15	5280	121 131 136	15	5070	119 129 135
	10	5180	121 132 138	10	4980	119 130 136	10	4780	117 129 135
	5	4960	121 132 138	5	4760	119 130 136	5	4570	117 128 135
	0	4860	121 132 138	0	4670	119 130 136	0	4480	117 128 135
	42	8310	134 139 142	43	7920	131 136 139	44	7550	128 133 136
	40	7500	129 135 137	40	7180	127 133 136	40	6870	125 132 135
	35	6860	127 134 137	35	6560	126 132 136	35	6280	124 131 135
	30	6290	126 133 137	30	6010	124 132 136	30	5760	122 130 135
3,000	25	5790	124 133 137	25	5560	122 131 136	25	5330	120 130 135
	20	5410	122 132 137	20	5200	121 131 136	20	4990	119 129 135
	15	5080	121 132 137	15	4880	119 130 136	15	4690	117 128 135
	10	4850	121 132 137	10	4660	119 130 136	10	4470	117 128 135
	5	4760	121 132 137	5	4570	119 130 136	5	4380	117 128 135
	0	4680	120 132 137	0	4490	118 130 136	0	4310	116 128 135

Table PER-22. FLAPS 0˚, ZERO WIND (SHEET 6 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 210 MPH

WT	25,000			24,500			24,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
	26	9930	136 142 145	28	9880	135 141 144	29	9280	131 137 140
8,000	25	9420	134 140 142	25	8510	129 134 137	25	8140	127 133 136
	20	8270	129 135 138	20	7920	127 134 137	20	7580	125 132 136
	15	7730	128 135 138	15	7410	126 133 137	15	7090	124 132 136
	10	7240	127 135 138	10	6930	125 133 137	10	6630	123 131 136
	5	6810	126 134 138	5	6520	124 133 137	5	6240	122 131 136
	0	6430	125 134 138	0	6170	123 132 137	0	5930	121 131 136
				31	9310	133 139 141	33	9350	133 139 141
	29	9310	134 140 143	30	8820	131 137 139	30	8110	127 133 135
7,000	25	8150	129 135 138	25	7800	127 134 137	25	7470	125 132 135
	20	7580	128 135 138	20	7260	126 133 137	20	6940	124 132 135
	15	7080	127 134 138	15	6780	125 133 137	15	6480	123 131 135
	10	6630	125 134 138	10	6340	123 132 137	10	6080	121 131 135
	5	6240	124 133 138	5	5990	122 132 137	5	5750	120 130 135
	0	5930	123 133 138	0	5690	121 132 137	0	5470	120 130 135
							36	8930	132 138 140
	32	8850	133 139 141	34	8890	133 138 140	35	8430	129 135 138
	30	8120	129 135 138	30	7780	128 134 137	30	7440	126 132 135
6,000	25	7480	128 135 138	25	7160	126 133 137	25	6850	124 132 135
	20	6950	127 134 138	20	6650	125 133 137	20	6360	123 131 135
	15	6490	125 134 138	15	6210	123 132 137	15	5960	121 131 135
	10	6080	124 133 138	10	5840	122 132 137	10	5600	120 130 135
	5	5760	123 133 138	5	5530	121 131 137	5	5310	119 130 135
	0	5470	122 132 138	0	5260	120 131 137	0	5050	118 129 135

Table PER-22. FLAPS 0˚, ZERO WIND (SHEET 7 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 210 MPH

WT	23,500			23,000			22,500		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
2,000	46	6770	124 130 133	46	6460	122 128 132	46	6150	120 127 130
	45	6640	124 130 133	45	6330	122 128 132	45	6030	120 127 130
	40	6030	122 129 133	40	5750	120 128 132	40	5490	118 126 130
	35	5520	120 129 133	35	5280	118 127 132	35	5040	116 125 130
	30	5090	118 128 133	30	4870	117 126 132	30	4660	114 125 130
	25	4720	117 127 133	25	4520	115 126 132	25	4340	113 124 131
	20	4460	116 127 133	20	4420	116 125 132	20	4380	116 124 131
	15	4300	116 127 133	15	4260	116 125 132	15	4220	116 124 131
	10	4420	116 127 133	10	4190	116 125 132	10	4140	116 124 131
	5	4170	116 127 133	5	4120	116 125 132	5	4070	116 124 131
	0	4090	116 127 133	0	4050	116 125 132	0	4010	116 124 131
1,000	48	6480	124 130 133	48	6180	122 128 132	48	5880	120 126 130
	45	6100	123 129 133	45	5820	121 128 132	45	5540	119 126 130
	40	5540	121 129 133	40	5300	119 127 132	40	5070	117 125 130
	35	5100	119 128 133	35	4880	117 126 132	35	4670	115 125 130
	30	4710	117 127 133	30	4510	115 126 132	30	4320	113 124 130
	25	4380	116 127 133	25	4290	115 125 132	25	4250	115 124 131
	20	4240	116 127 133	20	4200	116 125 132	20	4160	116 124 131
	15	4140	116 127 133	15	4100	116 125 132	15	4060	116 124 131
	10	4090	116 127 133	10	4050	116 125 132	10	4000	116 124 131
	5	4020	116 127 133	5	3980	116 125 132	5	3940	116 124 131
	0	3960	116 127 133	0	3910	116 125 132	0	3870	116 124 131
SEA LEVEL	50	6200	123 129 133	50	5920	121 128 132	50	5630	119 126 130
	45	5610	121 129 133	45	5360	119 127 132	45	5120	117 125 130
	40	5130	119 128 133	40	4900	118 126 132	40	4680	115 125 130
	35	4710	118 127 133	35	4510	116 126 132	35	4320	114 124 130
	30	4370	116 127 133	30	4210	114 125 132	30	4170	114 124 131
	25	4160	116 126 133	25	4130	116 125 132	25	4090	116 124 131
	20	4070	116 126 133	20	4030	116 125 132	20	3990	116 124 131
	15	4010	116 126 133	15	3970	116 125 132	15	3930	116 124 131
	10	3950	116 126 133	10	3910	116 125 132	10	3870	116 124 131
	5	3880	116 126 133	5	3840	116 125 132	5	3810	116 124 131
	0	3830	116 126 133	0	3780	116 125 132	0	3750	116 124 131

Table PER-22. FLAPS 0˚, ZERO WIND (SHEET 8 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 210 MPH

WT	23,500			23,000			22,500		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
	40	8080	128 133 136	40	7420	124 129 132	40	7070	122 128 131
	35	7710	124 130 134	35	6780	122 129 132	35	6460	120 127 131
	30	6520	122 130 134	30	6210	120 128 132	30	5910	118 127 131
5,000	25	5980	121 129 134	25	5720	119 128 132	25	5460	117 126 131
	20	5590	119 129 134	20	5350	117 127 132	20	5120	115 125 131
	15	5260	118 128 134	15	5040	116 127 132	15	4820	114 125 131
	10	4960	117 128 134	10	4750	115 126 132	10	4560	113 125 131
	5	4700	116 127 134	5	4590	115 126 133	5	4550	115 124 131
	0	4550	116 127 134	0	4510	116 126 133	0	4470	116 124 131
	42	7410	125 131 134	42	7080	123 129 132	42	6740	121 127 131
	40	7150	125 130 134	40	6820	123 129 132	40	6490	121 127 131
	35	6530	123 130 134	35	6230	121 128 132	35	5920	119 127 131
	30	5970	121 129 134	30	5710	119 128 132	30	5450	117 126 131
4,000	25	5520	119 129 134	25	5280	117 127 132	25	5050	115 125 131
	20	5170	118 128 134	20	4950	116 126 132	20	4740	114 125 131
	15	4860	117 128 134	15	4650	115 126 132	15	4520	114 124 131
	10	4610	116 127 134	10	4570	116 126 133	10	4520	116 124 131
	5	4460	116 127 134	5	4420	116 126 133	5	4380	116 124 131
	0	4380	116 127 134	0	4340	116 124 133	0	4300	116 124 131
	44	7080	125 130 133	44	6760	123 129 132	44	6440	121 127 130
	40	6560	123 130 133	40	6260	121 128 132	40	5960	119 127 130
	35	5590	121 129 133	35	5710	119 128 132	35	5460	117 126 130
	30	5510	120 129 133	30	5270	118 127 132	30	5030	116 125 130
3,000	25	5100	118 128 133	25	4890	116 126 132	25	4680	114 125 130
	20	4780	117 127 133	20	4580	115 126 132	20	4410	113 124 131
	15	4530	116 127 133	15	4490	116 126 132	15	4450	116 124 131
	10	4380	116 127 134	10	4340	116 126 132	10	4300	116 124 131
	5	4300	116 127 134	5	4260	116 126 132	5	4220	116 124 131
	0	4230	116 127 134	0	4190	116 126 132	0	4150	116 124 131

Table PER-22. FLAPS 0˚, ZERO WIND (SHEET 9 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 210 MPH

WT	23,500			23,000			22,500		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
	31	9270	131 136 139	33	9260	130 135 138	34	8680	126 132 134
	30	9120	130 136 136	30	8070	124 130 133	30	7680	122 128 131
8,000	25	7770	125 131 134	25	7420	123 129 133	25	7070	121 128 131
	20	7240	123 131 134	20	6910	121 129 133	20	6570	119 127 131
	15	6760	122 130 134	15	6450	120 129 133	15	6140	118 127 131
	10	6320	121 130 134	10	6050	119 128 133	10	5780	117 126 131
	5	5980	120 129 134	5	5720	118 128 133	5	5470	116 126 131
	0	5680	119 129 134	0	5440	117 127 133	0	5200	115 126 131
				36	8800	129 134 137	36	7830	123 128 131
	34	8810	130 135 137	35	8310	126 132 134	35	7680	122 128 131
	30	7740	125 131 134	30	7390	123 129 133	30	7040	121 128 131
7,000	25	7130	123 131 134	25	6800	121 129 133	25	6470	119 127 131
	20	6620	122 130 134	20	6320	120 128 133	20	6010	118 127 131
	15	6190	121 130 134	15	5920	119 128 133	15	5650	117 126 131
	10	5820	119 129 134	10	5570	117 127 133	10	5330	115 126 131
	5	5510	119 129 134	5	5280	117 127 133	5	5050	115 125 131
	0	5240	118 128 134	0	5020	116 127 133	0	4810	114 125 131
	38	8930	131 137 139	38	7950	125 131 134	38	7430	122 128 131
	35	7750	125 131 134	35	7400	123 129 132	35	7040	121 128 131
	30	7110	124 130 134	30	6780	122 129 132	30	6460	120 127 131
6,000	25	6540	122 130 134	25	6230	120 128 132	25	5940	118 127 131
	20	6070	121 129 134	20	5810	119 128 132	20	5540	117 126 131
	15	5700	119 129 134	15	5460	117 127 132	15	5220	115 126 131
	10	5370	118 128 134	10	5140	116 127 132	10	4930	114 125 131
	5	5090	117 128 134	5	4870	115 126 132	5	4670	113 125 131
	0	4850	116 128 134	0	4650	114 126 133	0	4610	114 125 131

Table PER-22. FLAPS 0˚, ZERO WIND (SHEET 10 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 210 MPH

WT	22,000			21,500			21,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
	46	5850	118 125 129	46	5550	116 123 127	46	5280	114 121 126
	45	5730	118 125 129	45	5450	116 123 127	45	5180	114 121 126
	40	5230	116 124 129	40	4990	114 122 127	40	4750	112 121 126
	35	4810	114 123 129	35	4590	112 122 127	35	4370	110 120 126
	30	4450	112 123 129	30	4260	111 121 128	30	4180	110 120 126
2,000	25	4270	113 123 129	25	4230	113 121 128	25	4180	113 120 126
	20	4330	116 123 129	20	4290	116 121 129	20	4250	116 121 128
	15	4180	116 123 130	15	4140	116 121 129	15	4110	116 121 128
	10	4100	116 123 130	10	4060	116 121 129	10	4030	116 121 128
	5	4040	116 123 130	5	4000	116 121 129	5	3960	116 121 128
	0	3970	116 123 130	0	3930	116 121 129	0	3900	116 121 128
	48	5600	118 125 129	48	5320	116 123 127	48	5060	114 121 126
	45	5280	117 124 129	45	5030	115 122 127	45	4790	112 121 126
	40	4840	115 124 129	40	4610	113 122 127	40	4390	111 120 126
	35	4450	113 123 129	35	4260	111 121 127	35	4080	109 120 126
	30	4150	111 122 129	30	4110	111 121 128	30	4070	111 120 127
1,000	25	4200	115 122 130	25	4160	115 121 129	25	4120	115 120 127
	20	4120	116 122 130	20	4080	116 121 129	20	4040	116 121 128
	15	4030	116 122 130	15	3990	116 121 129	15	3950	116 121 128
	10	3960	116 122 130	10	3930	116 121 129	10	3890	116 121 128
	5	3900	116 122 130	5	3860	116 121 129	5	3830	116 121 128
	0	3840	116 122 130	0	3800	116 121 129	0	3770	116 121 128
	50	5360	117 124 129	50	5100	115 123 127	50	4860	113 121 126
	45	4890	115 124 129	45	4660	113 122 127	45	4440	111 120 126
	40	4470	113 123 129	40	4280	111 121 127	40	4080	109 119 126
	35	4130	112 122 129	35	4040	111 121 128	35	4000	111 119 126
	30	4120	114 122 129	30	4080	114 121 128	30	4040	114 119 127
SEA LEVEL	25	4050	116 122 130	25	4010	116 121 129	25	3970	116 120 128
	20	3960	116 122 130	20	3920	116 121 129	20	3880	116 120 128
	15	3900	116 122 130	15	3860	116 121 129	15	3830	116 120 128
	10	3830	116 122 130	10	3800	116 121 129	10	3770	116 120 128
	5	3770	116 122 130	5	3740	116 121 129	5	3710	116 120 128
	0	3710	116 122 130	0	3680	116 121 129	0	3650	116 121 128

Table PER-22. FLAPS 0˚, ZERO WIND (SHEET 11 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 210 MPH

WT	22,000			21,500			21,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
	40	6710	120 126 129	40	6390	118 124 128	40	6060	115 122 126
	35	6140	118 125 129	35	5820	116 124 128	35	5540	114 122 126
	30	5640	116 125 129	30	5370	114 123 128	30	5110	112 121 126
5,000	25	5220	115 124 129	25	4970	113 122 128	25	4740	110 120 126
	20	4890	113 124 129	20	4680	111 122 128	20	4470	109 120 127
	15	4620	112 123 129	15	4490	111 122 128	15	4440	111 120 127
	10	4510	113 123 130	10	4470	113 122 129	10	4420	113 120 128
	5	4500	116 123 130	5	4460	116 122 129	5	4410	115 120 128
	0	4420	116 123 130	0	4380	116 122 129	0	4340	116 121 128
	42	6410	119 126 129	42	6090	117 124 128	42	5770	115 122 126
	40	6180	119 125 129	40	5860	116 124 128	40	5560	114 122 126
	35	5640	117 125 129	35	5370	115 123 128	35	5110	112 121 126
	30	5200	115 124 129	30	4960	113 122 128	30	4720	111 120 126
4,000	25	4830	113 123 129	25	4620	111 122 128	25	4410	109 120 126
	20	4530	112 123 129	20	4410	111 122 128	20	4360	111 120 127
	15	4470	114 123 130	15	4430	114 122 129	15	4380	114 121 128
	10	4480	116 123 130	10	4440	116 122 129	10	4390	116 121 128
	5	4340	116 123 130	5	4290	116 122 129	5	4250	116 121 128
	0	4250	116 123 130	0	4210	116 122 129	0	4170	116 121 128
	44	6120	119 125 129	44	5810	117 124 127	44	5510	114 122 126
	40	5670	117 125 129	40	5390	115 123 127	40	5130	113 121 126
	35	5210	115 124 129	35	4960	113 122 127	35	4720	111 121 126
	30	4810	114 123 129	30	4590	112 122 127	30	4380	110 120 126
3,000	25	4470	112 123 129	25	4320	111 122 128	25	4270	111 120 127
	20	4370	113 123 130	20	4320	113 121 129	20	4280	113 121 127
	15	4400	116 123 130	15	4360	116 121 129	15	4320	116 121 128
	10	4260	116 123 130	10	4220	116 121 129	10	4180	116 121 128
	5	4180	116 123 130	5	4140	116 121 129	5	4100	116 121 128
	0	4110	116 123 130	0	4070	116 121 129	0	4030	116 121 128

Table PER-22. FLAPS 0˚, ZERO WIND (SHEET 12 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 210 MPH

WT	22,000			21,500			21,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
	34	7850	121 127 130	34	7450	119 125 128	34	7070	117 123 127
	30	7320	120 127 130	30	6950	118 125 128	30	6580	116 123 127
8,000	25	6720	119 126 130	25	6370	116 124 128	25	6040	114 122 127
	20	6240	117 126 130	20	5940	115 124 128	20	5650	113 122 127
	15	5850	116 125 130	15	5580	114 123 128	15	5310	112 121 127
	10	5520	115 125 130	10	5260	113 123 128	10	5010	111 121 127
	5	5230	114 124 130	5	5000	112 123 128	5	4780	110 121 127
	0	4970	113 124 130	0	4760	111 122 128	0	4650	110 121 127
	36	7440	121 127 129	36	7070	119 125 128	36	6700	117 123 126
	35	7310	121 127 129	35	6940	118 125 128	35	6580	116 123 126
	30	6700	119 126 129	30	6360	117 124 128	30	6020	114 122 126
7,000	25	6160	117 125 129	25	5840	115 124 128	25	5560	113 122 126
	20	5740	116 125 129	20	5470	114 123 128	20	5200	112 121 126
	15	5400	115 124 129	15	5150	113 123 128	15	4900	110 121 126
	10	5090	113 124 129	10	4870	112 122 128	10	4650	110 121 127
	5	4830	113 124 130	5	4630	111 122 128	5	4590	111 121 127
	0	4610	112 124 130	0	4560	112 122 129	0	4510	112 121 128
	38	7080	120 126 129	38	6720	118 125 128	38	6370	116 123 126
	35	6700	119 126 129	35	6360	117 124 128	35	6030	115 122 126
	30	6140	118 125 129	30	5830	115 124 128	30	5540	113 122 126
6,000	25	5660	116 125 129	25	5390	114 123 128	25	5130	112 121 126
	20	5300	115 124 129	20	5050	112 122 128	20	4810	110 120 126
	15	4980	113 124 129	15	4770	111 122 128	15	4560	110 120 127
	10	4710	112 123 130	10	4580	111 122 129	10	4530	111 120 127
	5	4580	113 123 130	5	4530	113 122 129	5	4480	113 120 128
	0	4560	114 123 130	0	4510	114 122 129	0	4470	114 120 128

Table PER-22. FLAPS 0˚, ZERO WIND (SHEET 13 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 210 MPH

WT	20,500			20,000			19,500		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
	46	5020	112 120 124	46	4760	110 118 123	46	4520	108 116 121
	45	4930	112 119 124	45	4680	109 118 123	45	4450	107 116 121
	40	4520	110 119 124	40	4300	108 117 123	40	4110	106 116 122
	35	4190	108 119 125	35	4050	107 117 124	35	4000	107 116 122
	30	4140	110 119 125	30	4090	110 117 124	30	4050	110 116 123
2,000	25	4140	113 118 126	25	4100	113 117 125	25	4050	113 117 125
	20	4200	116 121 128	20	4160	116 121 128	20	4120	116 121 128
	15	4070	116 121 128	15	4030	116 121 128	15	3990	116 121 128
	10	3990	116 121 128	10	3950	116 121 128	10	3910	116 121 128
	5	3920	116 121 128	5	3890	116 121 128	5	3850	116 121 128
	0	3860	116 121 128	0	3820	116 121 128	0	3790	116 121 128
	48	4810	111 119 124	48	4570	109 117 122	48	4350	107 116 121
	45	4550	110 119 124	45	4320	108 117 122	45	4130	106 116 121
	40	4200	109 118 124	40	4010	107 117 123	40	3890	106 115 122
	35	4030	109 118 125	35	3980	109 117 124	35	3940	109 116 123
	30	4020	111 118 126	30	3980	111 117 125	30	3940	111 116 124
1,000	25	4080	115 119 127	25	4040	115 119 127	25	4000	115 119 127
	20	4000	116 121 128	20	3970	116 121 128	20	3920	116 121 128
	15	3920	116 121 128	15	3880	116 121 128	15	3840	116 121 128
	10	3860	116 121 128	10	3820	116 121 128	10	3780	116 121 128
	5	3790	116 121 128	5	3760	116 121 128	5	3720	116 121 128
	0	3730	116 121 128	0	3700	116 121 128	0	3660	116 121 128
	50	4610	111 119 124	50	4380	109 117 122	50	4180	107 116 121
	45	4230	109 118 124	45	4030	107 117 123	45	3860	105 115 122
	40	3930	108 118 125	40	3890	108 117 124	40	3840	108 115 122
	35	3950	111 118 125	35	3910	111 117 124	35	3870	111 115 123
	30	4000	114 119 126	30	3960	114 119 126	30	3920	114 119 126
SEA LEVEL	25	3930	116 120 128	25	3900	116 120 128	25	3860	116 120 128
	20	3850	116 121 128	20	3810	116 121 128	20	3780	116 121 128
	15	3790	116 121 128	15	3750	116 121 128	15	3720	116 121 128
	10	3730	116 121 128	10	3690	116 121 128	10	3660	116 121 128
	5	3670	116 121 128	5	3640	116 121 128	5	3600	116 121 128
	0	3610	116 121 128	0	3580	116 121 128	0	3550	116 121 128

Table PER-22. FLAPS 0˚, ZERO WIND (SHEET 14 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 210 MPH

WT	20,500			20,000			19,500		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
	40	5730	113 121 125	40	5430	111 119 123	40	5150	109 117 121
	35	5260	111 120 125	35	4990	109 118 123	35	4750	107 116 121
	30	4870	110 119 125	30	4630	108 118 123	30	4430	106 116 122
5,000	25	4540	109 119 125	25	4340	107 118 124	25	4280	107 116 123
	20	4400	109 119 126	20	4350	109 118 124	20	4310	109 116 123
	15	4400	111 119 126	15	4340	111 118 125	15	4300	111 116 124
	10	4380	113 119 127	10	4330	113 118 126	10	4280	113 117 126
	5	4370	115 120 127	5	4320	115 120 127	5	4280	115 120 127
	0	4300	116 121 128	0	4260	116 121 128	0	4210	116 121 128
	42	5470	113 120 125	42	5190	111 118 123	42	4920	108 116 121
	40	5280	112 120 125	40	5010	110 118 123	40	4760	108 116 121
	35	4860	110 119 125	35	4620	108 117 123	35	4410	106 116 122
	30	4520	109 119 125	30	4310	107 118 124	30	4180	106 116 122
4,000	25	4310	109 119 125	25	4260	109 118 124	25	4220	109 116 123
	20	4320	111 119 126	20	4260	111 118 125	20	4220	111 116 124
	15	4340	114 119 127	15	4290	114 118 126	15	4240	114 118 126
	10	4350	116 121 128	10	4300	116 121 128	10	4260	116 121 128
	5	4210	116 121 128	5	4170	116 121 128	5	4140	116 121 128
	0	4130	116 121 128	0	4100	116 121 128	0	4050	116 121 128
	44	5230	112 120 124	44	4970	110 118 123	44	4720	108 116 121
	40	4880	111 119 124	40	4630	109 117 123	40	4420	107 116 121
	35	4510	109 119 124	35	4300	107 117 123	35	4110	105 116 122
	30	4210	108 119 125	30	4160	108 117 124	30	4110	108 116 123
3,000	25	4230	111 119 126	25	4180	111 117 125	25	4130	111 116 123
	20	4230	113 119 126	20	4190	113 117 125	20	4150	113 117 125
	15	4270	116 121 127	15	4230	116 121 127	15	4180	116 121 127
	10	4140	116 121 128	10	4100	116 121 128	10	4060	116 121 128
	5	4060	116 121 128	5	4020	116 121 128	5	3980	116 121 128
	0	4000	116 121 128	0	3960	116 121 128	0	3920	116 121 128

Table PER-22. FLAPS 0˚, ZERO WIND (SHEET 15 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 210 MPH

WT	20,500			20,000			19,500		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
	34	6690	115 121 125	34	6320	113 120 123	34	5960	110 118 122
	30	6230	114 121 125	30	5880	111 119 123	30	5570	109 117 122
8,000	25	5730	112 120 125	25	5440	110 119 123	25	5180	108 117 122
	20	5370	111 120 125	20	5100	108 118 123	20	4880	107 117 122
	15	5070	110 120 125	15	4840	108 118 124	15	4630	106 117 123
	10	4810	109 120 126	10	4620	107 118 124	10	4570	107 117 123
	5	4640	109 120 126	5	4590	109 118 125	5	4540	109 117 124
	0	4600	110 119 126	0	4550	110 118 125	0	4500	110 117 124
	36	6340	114 121 125	36	5990	112 119 123	36	5660	110 117 122
	35	6230	114 121 125	35	5880	112 119 123	35	5570	109 117 122
	30	5710	112 120 125	30	5410	110 119 123	30	5140	108 117 122
7,000	25	5290	111 120 125	25	5020	109 118 123	25	4800	107 117 122
	20	4970	110 120 125	20	4740	108 118 124	20	4530	106 117 123
	15	4700	109 119 125	15	4530	107 118 124	15	4480	107 117 123
	10	4570	109 119 126	10	4510	109 118 125	10	4450	109 117 124
	5	4540	111 119 126	5	4480	111 118 125	5	4440	111 117 124
	0	4460	112 120 127	0	4420	112 118 125	0	4370	112 116 124
	38	6030	114 121 125	38	5700	111 119 123	38	5390	109 117 122
	35	5710	113 120 125	35	5410	110 119 123	35	5140	108 117 122
	30	5260	111 120 125	30	5000	109 118 123	30	4770	107 116 122
6,000	25	4900	110 119 125	25	4670	108 118 123	25	4460	106 116 122
	20	4610	109 119 125	20	4440	107 118 124	20	4390	107 117 123
	15	4510	109 119 126	15	4460	109 118 125	15	4410	109 117 124
	10	4480	111 119 126	10	4440	111 118 125	10	4380	111 116 124
	5	4430	113 119 127	5	4390	113 118 125	5	4340	113 117 125
	0	4420	114 119 127	0	4380	114 119 127	0	4330	114 119 127

Table PER-22. FLAPS 0˚, ZERO WIND (SHEET 16 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 210 MPH

WT	19,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT
2,000	46	4300	106 114 120
	45	4230	105 114 120
	40	3930	104 114 120
	35	3960	107 114 121
	30	4000	110 114 122
	25	4010	113 117 125
	20	4080	116 121 128
	15	3950	116 121 128
	10	3880	116 121 128
	5	3810	116 121 128
	0	3750	116 121 128
1,000	48	4130	105 114 120
	45	3950	104 114 120
	40	3840	106 114 121
	35	3900	109 114 122
	30	3900	111 116 124
	25	3960	115 119 127
	20	3890	116 121 128
	15	3810	116 121 128
	10	3750	116 121 128
	5	3690	116 121 128
	0	3630	116 121 128
SEA LEVEL	50	3970	105 114 120
	45	3780	103 114 120
	40	3800	108 114 121
	35	3830	111 115 123
	30	3880	114 119 126
	25	3820	116 120 128
	20	3740	116 121 128
	15	3690	116 121 128
	10	3630	116 121 128
	5	3570	116 121 128
	0	3510	116 121 128

Table PER-22. FLAPS 0˚, ZERO WIND (SHEET 17 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 210 MPH

WT	19,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT
5,000	40	4870	107 115 120
	35	4520	105 115 120
	30	4230	104 115 121
	25	4250	107 115 122
	20	4260	109 115 122
	15	4250	111 115 123
	10	4240	113 117 126
	5	4240	116 120 127
	0	4170	116 121 128
4,000	42	4660	106 115 120
	40	4520	106 115 120
	35	4210	105 115 121
	30	4150	105 115 121
	25	4170	109 115 122
	20	4170	111 115 123
	15	4200	114 118 126
	10	4220	116 121 128
	5	4090	116 121 128
	0	4020	116 121 128
3,000	44	4470	106 114 120
	40	4210	105 114 120
	35	4010	105 114 121
	30	4070	108 115 122
	25	4090	111 115 123
	20	4100	113 117 125
	15	4140	116 121 127
	10	4020	116 121 128
	5	3950	116 121 128
	0	3880	116 121 128

Table PER-22. FLAPS 0˚, ZERO WIND (SHEET 18 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 210 MPH

WT	19,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT
	34	5630	108 116 120
	30	5270	107 115 120
8,000	25	4920	106 115 120
	20	4660	105 115 121
	15	4510	105 115 122
	10	4520	107 115 122
	5	4490	109 115 122
	0	4450	110 115 123
	36	5360	108 115 120
	35	5270	107 115 120
	30	4890	106 115 120
7,000	25	4580	105 115 121
	20	4400	105 115 121
	15	4430	107 115 122
	10	4410	109 115 122
	5	4390	111 115 123
	0	4330	112 116 124
	38	5110	107 115 120
	35	4860	106 115 120
	30	4550	105 115 121
6,000	25	4310	105 115 121
	20	4350	107 115 122
	15	4360	109 115 122
	10	4330	111 115 124
	5	4300	113 117 125
	0	4290	114 119 127

Table PER-23. FLAPS 0˚, 10 KT HEADWIND (SHEET 1 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 210 MPH

WT	28,000			27,000			26,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
							42	7850	135 142 144
	36	7980	138 145 148	39	8010	138 144 147	40	7040	131 137 140
	35	7570	136 142 146	35	6890	132 139 142	35	6430	129 136 140
	30	6770	133 140 144	30	6320	130 138 142	30	5880	127 136 140
2,000	25	6210	131 140 144	25	5790	128 137 142	25	5410	125 135 140
	20	5750	130 139 144	20	5400	127 137 142	20	5050	124 135 140
	15	5470	129 139 144	15	5130	126 137 142	15	4830	124 135 140
	10	5360	129 139 144	10	5030	127 137 142	10	4730	124 135 140
	5	5260	129 139 144	5	4940	127 137 142	5	4650	124 135 140
	0	5180	129 139 144	0	4860	127 137 142	0	4570	124 135 140
				42	7700	137 143 145	45	7610	135 141 143
	39	7670	137 144 147	40	6960	132 139 142	40	6470	129 136 140
	35	7220	134 140 144	35	6330	131 138 142	35	5900	128 136 140
	30	6210	132 140 144	30	5790	129 137 142	30	5400	126 135 140
1,000	25	5700	130 139 144	25	5340	127 137 142	25	5010	124 135 140
	20	5370	129 139 144	20	5040	126 137 142	20	4740	123 134 140
	15	5240	129 139 144	15	4920	126 137 142	15	4630	123 134 140
	10	5160	129 139 144	10	4840	126 137 142	10	4550	124 134 140
	5	5070	129 139 144	5	4760	126 137 142	5	4480	124 134 140
	0	4990	129 139 144	0	4680	127 137 142	0	4410	124 134 140
							47	7020	132 139 141
	42	7430	137 143 146	45	7540	137 143 145	45	6550	130 136 140
	40	6840	134 140 144	40	6380	131 138 142	40	5940	128 136 140
	35	6220	132 139 144	35	5810	129 137 142	35	5400	126 135 140
	30	5700	130 139 144	30	5330	127 137 142	30	4990	124 134 140
SEA LEVEL	25	5300	129 139 144	25	4970	126 136 142	25	4670	123 134 140
	20	5130	129 138 144	20	4820	126 136 142	20	4530	123 134 140
	15	5060	129 138 144	15	4750	126 136 142	15	4460	123 134 140
	10	4970	129 138 144	10	4670	126 136 142	10	4390	123 134 140
	5	4890	129 138 144	5	4590	126 136 142	5	4320	123 134 140
	0	4820	129 138 144	0	4520	126 136 142	0	4250	123 134 140

Table PER-23. FLAPS 0˚, 10 KT HEADWIND (SHEET 2 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 210 MPH

WT	28,000			27,000			26,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
							32	8320	135 141 143
	26	8710	139 145 149	29	8590	137 144 147	30	7620	131 138 140
5,000	25	8300	137 143 147	25	7510	132 139 142	25	7000	130 137 140
	20	7490	134 141 144	20	6990	131 139 142	20	6510	128 137 140
	15	6990	133 140 144	15	6520	130 138 142	15	6060	127 136 140
	10	6530	131 140 144	10	6080	128 138 142	10	5680	125 136 140
	5	6130	130 140 144	5	5730	127 137 142	5	5380	125 135 140
	0	5850	129 139 144	0	5480	127 137 142	0	5160	124 135 140
							36	8460	137 143 146
				32	8180	136 143 145	35	7980	134 140 143
	29	8240	137 144 148	30	7960	133 139 142	30	6990	130 137 140
4,000	25	7390	134 141 144	25	6890	131 139 142	25	6420	128 136 140
	20	6860	133 140 144	20	6400	130 138 142	20	5960	127 136 140
	15	6390	131 140 144	15	5960	128 138 142	15	5570	125 135 140
	10	5970	130 139 144	10	5600	127 137 142	10	5240	124 135 140
	5	5710	129 139 144	5	5350	127 137 142	5	5040	124 135 140
	0	5600	129 139 144	0	5250	127 137 142	0	4940	124 135 140
				36	8320	138 145 147	39	8100	136 142 145
	33	8300	139 145 149	35	7840	136 142 145	35	7000	130 137 140
	30	7370	134 141 144	30	6880	132 139 142	30	6410	129 136 140
3,000	25	6780	133 140 144	25	6320	130 138 142	25	5880	127 136 140
	20	6290	131 140 144	20	5860	128 138 142	20	5470	125 135 140
	15	5850	130 139 144	15	5480	127 137 142	15	5140	124 135 140
	10	5580	129 139 144	10	5240	127 137 142	10	4930	124 135 140
	5	5480	129 139 144	5	5140	127 137 142	5	4830	124 135 140
	0	5380	129 139 144	0	5050	127 137 142	0	4750	124 135 140

Table PER-23. FLAPS 0˚, 10 KT HEADWIND (SHEET 3 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 210 MPH

WT	28,000			27,000			26,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
8,000							22	9630	138 144 148
				18	9910	141 147 151	20	8820	134 141 144
	14	11320	138 148 152	15	8740	135 142 145	15	7920	131 138 141
	10	8590	135 142 146	10	7970	133 140 143	10	7410	130 137 141
	5	8040	134 141 145	5	7480	132 139 143	5	6960	129 137 141
	0	7580	133 141 145	0	7060	131 139 143	0	6580	128 137 141
7,000							26	9290	138 144 147
				22	9390	139 146 149	25	8840	135 142 144
	18	9390	140 147 150	20	8610	135 142 145	20	7760	131 138 141
	15	8380	135 142 146	15	7780	132 140 143	15	7250	130 137 141
	10	7810	134 141 145	10	7280	131 139 143	10	6780	128 137 141
	5	7340	133 141 145	5	6840	130 139 143	5	6360	127 136 141
	0	6940	132 141 145	0	6470	129 138 143	0	6020	126 136 141
6,000				26	9130	139 145 149	29	8750	136 142 145
	22	8970	139 146 149	25	8680	137 143 146	25	7650	131 138 141
	20	8290	136 142 146	20	7630	132 139 143	20	7110	130 137 141
	15	7640	134 141 145	15	7120	131 139 143	15	6630	128 137 141
	10	7150	133 141 145	10	6660	130 139 143	10	6200	127 136 141
	5	6710	132 140 145	5	6250	129 138 143	5	5840	126 136 141
	0	6340	131 140 145	0	5910	128 138 143	0	5550	125 136 141



Table PER-23. FLAPS 0˚, 10 KT HEADWIND (SHEET 4 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 210 MPH

WT	25,000			24,500			24,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
				46	7240	130 136 138	46	6650	125 132 135
	45	7610	133 139 141	45	6830	127 133 136	45	6520	125 132 135
	40	6480	127 134 137	40	6200	125 133 136	40	5920	123 131 135
	35	5910	125 133 137	35	5650	123 132 136	35	5390	121 130 135
	30	5410	123 133 137	30	5190	121 131 136	30	4970	120 130 135
2,000	25	5000	122 132 137	25	4810	120 131 136	25	4610	118 129 135
	20	4680	120 132 137	20	4490	119 130 136	20	4310	117 128 135
	15	4470	120 131 137	15	4280	118 130 136	15	4100	116 128 135
	10	4380	120 131 137	10	4190	118 130 136	10	4020	116 128 135
	5	4300	120 131 137	5	4120	118 130 136	5	3950	116 128 135
	0	4230	120 131 137	0	4060	118 130 136	0	3890	116 128 135
	48	7460	133 139 141	48	6690	127 133 136	48	6630	125 131 134
	45	6550	128 134 137	45	6260	126 133 136	45	5980	124 131 134
	40	5950	126 133 137	40	5680	124 132 136	40	5430	122 130 134
	35	5420	124 133 137	35	5190	122 131 136	35	4980	120 130 134
	30	4990	122 132 137	30	4790	120 131 136	30	4590	118 129 134
1,000	25	4630	121 131 137	25	4440	119 130 136	25	4260	117 128 134
	20	4390	120 131 137	20	4200	118 130 136	20	4040	116 128 134
	15	4280	120 131 137	15	4100	118 130 136	15	3940	116 128 134
	10	4210	120 131 137	10	4040	118 130 136	10	3880	116 128 134
	5	4140	120 131 137	5	3970	118 130 136	5	3810	116 128 134
	0	4080	120 131 137	0	3910	118 130 136	0	3750	116 128 134
	50	6880	130 136 139	50	6360	127 133 136	50	6080	125 131 134
	45	6020	126 134 137	45	5750	125 132 136	45	5490	123 130 134
	40	5470	125 133 137	40	5230	123 131 136	40	5000	121 130 134
	35	4990	123 132 137	35	4790	121 131 136	35	4590	119 129 134
	30	4620	121 131 137	30	4430	119 130 136	30	4250	117 128 134
SEA LEVEL	25	4320	120 131 137	25	4140	118 129 136	25	3970	116 128 134
	20	4190	120 131 137	20	4020	118 129 136	20	3870	116 128 134
	15	4130	120 131 137	15	3960	118 129 136	15	3810	116 128 134
	10	4060	120 131 137	10	3890	118 129 136	10	3750	116 128 134
	5	3990	120 131 137	5	3830	118 129 136	5	3680	116 128 134
	0	3930	120 131 137	0	3770	118 129 136	0	3620	116 128 134

Table PER-23. FLAPS 0˚, 10 KT HEADWIND (SHEET 5 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 210 MPH

WT	25,000			24,500			24,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
	36	8510	134 141 143	37	8060	131 137 139	39	8090	131 137 139
	35	8010	132 138 140	35	7330	127 134 136	35	7010	125 132 135
	30	7020	128 135 138	30	6720	126 133 136	30	6420	124 132 135
5,000	25	6440	126 134 138	25	6150	124 133 136	25	5880	122 131 135
	20	5980	124 134 138	20	5710	122 132 136	20	5480	120 130 135
	15	5590	123 133 138	15	5370	121 132 136	15	5150	119 130 135
	10	5260	122 133 138	10	5050	120 131 136	10	4850	118 129 135
	5	4990	121 132 138	5	4780	119 131 136	5	4590	117 129 135
	0	4780	120 132 138	0	4580	118 130 136	0	4380	116 129 135
							42	7790	130 136 139
	39	8150	134 140 142	40	7740	130 137 139	40	7040	126 132 135
	35	7030	128 135 138	35	6720	126 133 136	35	6420	124 132 135
	30	6430	126 134 138	30	6150	124 132 136	30	5870	122 131 135
4,000	25	5900	124 133 138	25	5640	122 132 136	25	5400	121 130 135
	20	5490	123 133 138	20	5270	121 131 136	20	5060	119 130 135
	15	5150	122 132 138	15	4950	120 131 136	15	4750	118 129 135
	10	4860	121 132 138	10	4660	119 130 136	10	4470	117 129 135
	5	4660	120 132 138	5	4470	118 130 136	5	4280	116 128 135
	0	4570	120 132 138	0	4380	118 130 136	0	4190	116 128 135
	42	7860	133 139 142	43	7470	130 136 139	44	7110	127 133 136
	40	7060	128 135 137	40	6750	126 133 136	40	6450	125 132 135
	35	6440	127 134 137	35	6160	125 132 136	35	5880	123 131 135
	30	5890	125 133 137	30	5630	123 132 136	30	5380	121 130 135
3,000	25	5420	123 133 137	25	5200	121 131 136	25	4990	119 130 135
	20	5070	122 132 137	20	4870	120 131 136	20	4670	118 129 135
	15	4760	120 132 137	15	4570	119 130 136	15	4380	117 128 135
	10	4560	120 132 137	10	4370	118 130 136	10	4180	116 128 135
	5	4470	120 132 137	5	4290	118 130 136	5	4100	116 128 135
	0	4400	120 132 137	0	4210	118 130 136	0	4040	116 128 135

Table PER-23. FLAPS 0˚, 10 KT HEADWIND (SHEET 6 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 210 MPH

WT	25,000			24,500			24,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
	26	9450	136 142 145	28	9410	135 141 144	29	8810	131 137 140
8,000	25	8950	133 140 142	25	8050	128 134 137	25	7690	126 133 136
	20	7810	129 135 138	20	7480	127 134 137	20	7150	125 132 136
	15	7300	127 135 138	15	6980	125 133 137	15	6670	123 132 136
	10	6820	126 135 138	10	6530	124 133 137	10	6230	122 131 136
	5	6410	125 134 138	5	6130	123 133 137	5	5860	121 131 136
	0	6040	124 134 138	0	5800	122 132 137	0	5560	120 131 136
				31	8840	133 139 141	33	8880	133 139 141
	29	8840	134 140 143	30	8360	131 137 139	30	7660	126 133 135
7,000	25	7700	129 135 138	25	7360	127 134 137	25	7040	125 132 135
	20	7150	127 135 138	20	6840	125 133 137	20	6530	123 132 135
	15	6670	126 134 138	15	6380	124 133 137	15	6090	122 131 135
	10	6230	125 134 138	10	5950	122 132 137	10	5710	121 131 135
	5	5860	123 133 138	5	5630	122 132 137	5	5400	120 130 135
	0	5570	123 133 138	0	5350	121 132 137	0	5130	119 130 135
							36	8470	132 138 140
	32	8390	133 139 141	34	8420	132 138 140	35	7970	129 135 138
	30	7670	129 135 138	30	7340	127 134 137	30	7010	125 132 135
6,000	25	7050	127 135 138	25	6740	125 133 137	25	6440	123 132 135
	20	6540	126 134 138	20	6250	124 133 137	20	5970	122 131 135
	15	6100	124 134 138	15	5820	122 132 137	15	5590	121 131 135
	10	5710	123 133 138	10	5480	121 132 137	10	5260	119 130 135
	5	5400	122 133 138	5	5190	120 131 137	5	4980	119 130 135
	0	5140	121 132 138	0	4930	119 131 137	0	4730	118 129 135

Table PER-23. FLAPS 0˚, 10 KT HEADWIND (SHEET 7 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 210 MPH

WT	23,500			23,000			22,500		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
	46	6350	124 130 133	46	6050	122 128 132	46	5750	120 127 130
	45	6220	123 130 133	45	5930	121 128 132	45	5640	119 127 130
	40	5630	121 129 133	40	5380	119 128 132	40	5130	117 126 130
	35	5150	119 129 133	35	4930	117 127 132	35	4710	115 125 130
	30	4760	118 128 133	30	4550	116 126 132	30	4350	114 125 130
2,000	25	4410	116 127 133	25	4220	114 126 132	25	4070	113 124 131
	20	4220	116 127 133	20	4180	116 125 132	20	4130	116 124 131
	15	4060	116 127 133	15	4030	116 125 132	15	3990	116 124 131
	10	3980	116 127 133	10	3950	116 125 132	10	3910	116 124 131
	5	3920	116 127 133	5	3880	116 125 132	5	3850	116 124 131
	0	3860	116 127 133	0	3820	116 125 132	0	3780	116 124 131
	48	6060	123 130 133	48	5780	121 128 132	48	5490	119 126 130
	45	5700	122 129 133	45	5440	120 127 132	45	5190	118 126 130
	40	5190	120 129 133	40	4950	118 127 132	40	4720	116 125 130
	35	4760	118 128 133	35	4560	116 126 132	35	4350	114 125 130
	30	4400	116 127 133	30	4210	114 126 132	30	4020	112 124 130
1,000	25	4090	115 127 133	25	4050	115 125 132	25	4010	115 124 131
	20	4000	116 127 133	20	3970	116 125 132	20	3930	116 124 131
	15	3900	116 127 133	15	3870	116 125 132	15	3840	116 124 131
	10	3840	116 127 133	10	3810	116 125 132	10	3770	116 124 131
	5	3780	116 127 133	5	3740	116 125 132	5	3710	116 124 131
	0	3710	116 127 133	0	3680	116 125 132	0	3650	116 124 131
	50	5790	123 129 133	50	5520	121 128 132	50	5250	116 124 131
	45	5250	121 129 133	45	5020	119 127 132	45	4780	117 125 130
	40	4780	119 128 133	40	4570	117 126 132	40	4370	115 125 130
	35	4400	117 127 133	35	4210	115 126 132	35	4020	113 124 130
	30	4070	115 127 133	30	3970	114 125 132	30	3930	114 124 131
SEA LEVEL	25	3930	116 126 133	25	3890	116 125 132	25	3860	116 124 131
	20	3840	116 126 133	20	3800	116 125 132	20	3770	116 124 131
	15	3780	116 126 133	15	3740	116 125 132	15	3710	116 124 131
	10	3710	116 126 133	10	3680	116 125 132	10	3650	116 124 131
	5	3650	116 126 133	5	3620	116 125 132	5	3590	116 124 131
	0	3590	116 126 133	0	3560	116 125 132	0	3530	116 124 131

Table PER-23. FLAPS 0˚, 10 KT HEADWIND (SHEET 8 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 210 MPH

WT	23,500			23,000			22,500		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
	40	7630	127 133 136	40	6980	123 129 132	40	6650	121 128 131
	35	6680	123 130 134	35	6370	121 129 132	35	6050	119 127 131
	30	6110	122 130 134	30	5820	120 128 132	30	5530	117 127 131
5,000	25	5600	120 129 134	25	5360	118 128 132	25	5120	116 126 131
	20	5240	119 129 134	20	5020	117 127 132	20	4800	115 125 131
	15	4930	117 128 134	15	4720	115 127 132	15	4150	113 125 131
	10	4640	116 128 134	10	4440	114 126 132	10	4310	113 125 131
	5	4390	115 127 134	5	4340	115 126 133	5	4300	115 124 131
	0	4310	116 127 134	0	4270	116 126 133	0	4220	116 124 131
	42	6970	125 131 134	42	6650	123 129 132	42	6330	121 127 131
	40	6720	124 130 134	40	6400	122 129 132	40	6090	120 127 131
	35	6120	122 130 134	35	5830	120 128 132	35	5560	118 127 131
	30	5610	120 129 134	30	5340	118 128 132	30	5100	116 126 131
4,000	25	5170	119 129 134	25	4950	117 127 132	25	4730	115 125 131
	20	4840	117 128 134	20	4630	115 126 132	20	4430	113 125 131
	15	4550	116 128 134	15	4350	114 126 132	15	4270	114 124 131
	10	4360	116 127 134	10	4320	116 126 133	10	4380	116 124 131
	5	4220	116 127 134	5	4180	116 126 133	5	4140	116 124 131
	0	4140	116 127 134	0	4100	116 126 133	0	4060	116 124 131
	44	6650	124 130 133	44	6340	122 129 132	44	6030	120 127 130
	40	6150	123 130 133	40	5860	121 128 132	40	5540	119 127 130
	35	5600	121 129 133	35	5330	119 128 132	35	5100	117 126 130
	30	5150	119 129 133	30	4930	117 127 132	30	4710	115 125 130
3,000	25	4780	117 128 133	25	4570	115 126 132	25	4370	113 125 130
	20	4470	116 127 133	20	4270	114 126 132	20	4170	113 124 131
	15	4290	116 127 133	15	4490	116 126 132	15	4200	116 124 131
	10	4140	116 127 134	10	4100	116 126 132	10	4060	116 124 131
	5	4060	116 127 134	5	4020	116 126 132	5	3980	116 124 131
	0	3990	116 127 134	0	3960	116 126 132	0	3920	116 124 131

Table PER-23. FLAPS 0˚, 10 KT HEADWIND (SHEET 9 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 210 MPH

WT	23,500			23,000			22,500		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
	31	8800	130 136 139	33	8790	130 135 138	34	8220	126 132 134
	30	8650	130 136 136	30	7620	124 130 133	30	7250	122 128 131
8,000	25	7330	124 131 134	25	6990	122 129 133	25	6650	120 128 131
	20	6820	123 131 134	20	6490	121 129 133	20	6170	119 127 131
	15	6360	121 130 134	15	6050	119 129 133	15	5760	117 127 131
	10	5940	120 130 134	10	5680	118 128 133	10	5420	116 126 131
	5	5610	119 129 134	5	5370	117 128 133	5	5140	115 126 131
	0	5330	118 129 134	0	5110	116 127 133	0	4880	114 126 131
				36	8330	128 134 137	36	7390	122 128 131
	34	8350	129 135 137	35	7860	126 132 134	35	7240	122 128 131
	30	7310	124 131 134	30	6970	122 129 133	30	6620	120 128 131
7,000	25	6710	123 131 134	25	6400	121 129 133	25	6080	119 127 131
	20	6220	121 130 134	20	5930	119 128 133	20	5640	117 127 131
	15	5800	120 130 134	15	5550	118 128 133	15	5300	116 126 131
	10	5460	119 129 134	10	5230	117 127 133	10	5000	115 126 131
	5	5170	118 129 134	5	4950	116 127 133	5	4740	114 125 131
	0	4910	117 128 134	0	4700	115 127 133	0	4500	113 125 131
	38	8470	131 137 139	38	7500	125 131 134	38	7000	122 128 131
	35	7300	125 131 134	35	6960	123 129 132	35	6620	121 128 131
	30	6690	123 130 134	30	6370	121 129 132	30	6060	119 127 131
6,000	25	6140	121 130 134	25	5840	119 128 132	25	5560	117 127 131
	20	5690	120 129 134	20	5440	118 128 132	20	5200	116 126 131
	15	5350	119 129 134	15	5120	117 127 132	15	4890	115 126 131
	10	5040	118 128 134	10	4820	116 127 132	10	4610	114 125 131
	5	4770	117 128 134	5	4560	115 126 132	5	4370	113 125 131
	0	4530	116 128 134	0	4400	114 126 133	0	4360	114 125 131

Table PER-23. FLAPS 0˚, 10 KT HEADWIND (SHEET 10 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 210 MPH

WT	22,000			21,500			21,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
2,000	46	5480	118 125 129	46	5200	116 123 127	46	4930	114 121 126
	45	5340	117 125 129	45	5070	115 123 127	45	4810	113 121 126
	40	4880	115 124 129	40	4650	113 122 127	40	4420	111 121 126
	35	4490	113 123 129	35	4280	111 122 127	35	4070	109 120 126
	30	4150	112 123 129	30	3990	110 121 128	30	3950	110 120 126
	25	4030	113 123 129	25	3990	113 121 128	25	3950	113 120 127
	20	4090	116 123 130	20	4050	116 121 129	20	4010	116 121 128
	15	3950	116 123 130	15	3920	116 121 129	15	3880	116 121 128
	10	3880	116 123 130	10	3840	116 121 129	10	3800	116 121 128
	5	3810	116 123 130	5	3770	116 121 129	5	3740	116 121 128
	0	3750	116 123 130	0	3710	116 121 129	0	3680	116 121 128
1,000	48	5240	117 125 129	48	4990	115 123 127	48	4740	113 120 126
	45	4940	116 125 129	45	4700	114 123 127	45	4460	112 121 126
	40	4510	114 124 129	40	4290	112 122 127	40	4090	110 120 126
	35	4150	112 123 129	35	3970	110 121 127	35	3840	109 120 126
	30	3920	111 122 129	30	3880	111 121 128	30	3860	111 120 127
	25	3970	115 122 130	25	3930	115 121 129	25	3890	115 120 127
	20	3890	116 122 130	20	3850	116 121 129	20	3820	116 121 128
	15	3800	116 122 130	15	3770	116 121 129	15	3730	116 121 128
	10	3740	116 122 130	10	3710	116 121 129	10	3670	116 121 128
	5	3680	116 122 130	5	3640	116 121 129	5	3610	116 121 128
	0	3620	116 122 130	0	3590	116 121 129	0	3550	116 121 128
SEA LEVEL	50	5010	117 124 129	50	4770	114 123 127	50	4530	112 121 126
	45	4540	115 124 129	45	4330	113 122 127	45	4130	111 120 126
	40	4170	113 123 129	40	3980	111 121 127	40	3790	109 119 126
	35	3840	112 122 129	35	3800	111 121 128	35	3760	111 119 126
	30	3890	114 122 129	30	3850	114 121 128	30	3810	114 119 127
	25	3820	116 122 130	25	3780	116 121 129	25	3750	116 120 128
	20	3730	116 122 130	20	3700	116 121 129	20	3670	116 121 128
	15	3680	116 122 130	15	3640	116 121 129	15	3610	116 121 128
	10	3610	116 122 130	10	3580	116 121 129	10	3550	116 121 128
	5	3560	116 122 130	5	3530	116 121 129	5	3500	116 121 128
	0	3500	116 122 130	0	3470	116 121 129	0	3430	116 121 128

Table PER-23. FLAPS 0˚, 10 KT HEADWIND (SHEET 11 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 210 MPH

WT	22,000			21,500			21,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
	40	6320	119 126 129	40	5990	117 124 128	40	5660	115 122 126
	35	5690	117 125 129	35	5430	115 123 128	35	5170	113 122 126
	30	5270	115 125 129	30	5020	113 123 128	30	4780	111 121 126
5,000	25	4880	114 124 129	25	4650	112 122 128	25	4430	110 120 126
	20	4580	113 124 129	20	4370	111 122 128	20	4210	109 120 127
	15	4310	111 123 129	15	4240	111 122 128	15	4200	111 120 127
	10	4270	113 123 130	10	4220	113 122 129	10	4190	113 120 128
	5	4250	115 123 130	5	4210	115 122 129	5	4180	115 120 128
	0	4180	116 123 130	0	4150	116 122 129	0	4110	116 121 128
	42	6010	119 126 129	42	5690	116 124 128	42	5370	114 122 126
	40	5780	118 125 129	40	5450	115 124 128	40	4180	113 122 126
	35	5270	116 125 129	35	5020	114 123 128	35	4770	112 121 126
	30	4870	114 124 129	30	4640	112 122 128	30	4410	111 120 126
4,000	25	4510	113 123 129	25	4310	111 122 128	25	4120	109 120 126
	20	4230	111 123 129	20	4160	111 122 128	20	4120	111 120 127
	15	4230	114 123 130	15	4190	114 122 129	15	4140	114 121 128
	10	4230	116 123 130	10	4190	116 122 129	10	4150	116 121 128
	5	4100	116 123 130	5	4060	116 122 129	5	4020	116 121 128
	0	4020	116 123 130	0	3980	116 122 129	0	3950	116 121 128
	44	5730	118 125 129	44	5450	117 122 127	44	5180	113 121 126
	40	5270	117 125 129	40	5030	115 122 127	40	4790	112 121 126
	35	4860	115 124 129	35	4630	113 122 127	35	4410	111 121 126
	30	4490	113 123 129	30	4290	111 122 127	30	4080	109 120 126
3,000	25	4170	111 123 129	25	4080	111 122 128	25	4030	111 120 127
	20	4130	113 123 130	20	4080	113 121 129	20	4030	113 121 127
	15	4150	116 123 130	15	4120	116 121 129	15	4080	116 121 128
	10	4020	116 123 130	10	3990	116 121 129	10	3950	116 121 128
	5	3950	116 123 130	5	3910	116 121 129	5	3870	116 121 128
	0	3880	116 123 130	0	3840	116 121 129	0	3810	116 121 128

Table PER-23. FLAPS 0˚, 10 KT HEADWIND (SHEET 12 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 210 MPH

WT	22,000			21,500			21,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
8,000	34	7400	121 127 130	34	7020	119 125 128	34	6640	117 123 127
	30	6890	120 127 130	30	6530	117 125 128	30	6180	115 123 127
	25	6130	118 126 130	25	5980	116 124 128	25	5660	113 122 127
	20	5860	116 126 130	20	5570	114 124 128	20	5290	112 122 127
	15	5500	115 125 130	15	5230	113 123 128	15	4980	111 121 127
	10	5180	114 125 130	10	4940	112 123 128	10	4700	110 121 127
	5	4900	113 124 130	5	4690	111 123 128	5	4470	109 121 127
	0	4650	112 124 130	0	4450	110 122 128	0	4400	110 121 127
7,000	36	7010	120 127 129	36	6640	118 125 128	36	6290	116 123 126
	35	6880	120 127 129	35	6530	118 125 128	35	6180	116 123 126
	30	6290	118 126 129	30	5960	116 124 128	30	5630	113 122 126
	25	5770	116 125 129	25	5480	114 124 128	25	5210	112 122 126
	20	5380	115 125 129	20	5130	113 123 128	20	4880	111 121 126
	15	5060	114 124 129	15	4820	112 123 128	15	4590	110 121 126
	10	4770	113 124 129	10	4560	111 122 128	10	4370	109 121 127
	5	4520	112 124 130	5	4380	111 122 128	5	4340	111 121 127
	0	4360	112 124 130	0	4310	112 122 129	0	4270	112 121 128
6,000	38	6650	120 126 129	38	6310	117 125 128	38	5970	115 123 126
	35	6290	119 126 129	35	5960	116 124 128	35	5620	114 122 126
	30	5750	117 125 129	30	5450	115 124 128	30	5180	112 122 126
	25	5300	115 125 129	25	5050	113 123 128	25	4810	111 121 126
	20	4960	114 124 129	20	4730	112 122 128	20	4500	110 121 126
	15	4670	113 124 129	15	4460	111 122 128	15	4310	109 121 127
	10	4410	112 123 130	10	4330	111 122 129	10	4280	111 121 127
	5	4330	113 123 130	5	4290	113 122 129	5	4250	113 120 128
	0	4320	114 123 130	0	4280	114 122 129	0	4230	114 120 128

Table PER-23. FLAPS 0˚, 10 KT HEADWIND (SHEET 13 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 210 MPH

WT	20,500			20,000			19,500		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
2,000	46	4680	111 120 124	46	4340	109 118 123	46	4210	107 116 121
	45	4560	111 119 124	45	4350	109 118 123	45	4140	107 116 121
	40	4210	109 119 124	40	4000	107 117 123	40	3820	105 116 122
	35	3890	107 119 125	35	3810	107 117 124	35	3780	107 116 122
	30	3900	110 119 125	30	3860	110 117 124	30	3820	110 116 123
	25	3910	113 118 126	25	3870	113 117 125	25	3830	113 117 125
	20	3970	116 121 128	20	3930	116 121 128	20	3890	116 121 128
	15	3840	116 121 128	15	3800	116 121 128	15	3770	116 121 128
	10	3770	116 121 128	10	3730	116 121 128	10	3700	116 121 128
	5	3700	116 121 128	5	3670	116 121 128	5	3640	116 121 128
	0	3650	116 121 128	0	3610	116 121 128	0	3580	116 121 128
1,000	48	4490	111 119 124	48	4250	109 117 122	48	4040	107 116 121
	45	4240	110 119 124	45	4020	107 117 122	45	3840	106 116 121
	40	3900	108 118 124	40	3730	106 117 123	40	3660	106 115 122
	35	3800	109 118 125	35	3760	109 117 124	35	3710	109 116 123
	30	3800	111 118 126	30	3760	111 117 125	30	3720	111 116 124
	25	3850	115 119 127	25	3810	115 119 127	25	3780	115 119 127
	20	3780	116 121 128	20	3740	116 121 128	20	3710	116 121 128
	15	3700	116 121 128	15	3660	116 121 128	15	3630	116 121 128
	10	3640	116 121 128	10	3600	116 121 128	10	3570	116 121 128
	5	3580	116 121 128	5	3540	116 121 128	5	3510	116 121 128
	0	3520	116 121 128	0	3490	116 121 128	0	3450	116 121 128
SEA LEVEL	50	4290	110 118 124	50	4070	108 117 122	50	3880	106 116 121
	45	3930	109 118 124	45	3740	107 117 123	45	3580	105 115 122
	40	3700	108 118 125	40	3660	108 117 124	40	3620	108 115 122
	35	3720	111 118 125	35	3680	111 117 124	35	3640	111 115 123
	30	3770	114 119 126	30	3740	114 119 126	30	3700	114 119 126
	25	3710	116 121 128	25	3680	116 121 128	25	3640	116 120 128
	20	3630	116 121 128	20	3600	116 121 128	20	3570	116 121 128
	15	3580	116 121 128	15	3540	116 121 128	15	3510	116 121 128
	10	3520	116 121 128	10	3480	116 121 128	10	3450	116 121 128
	5	3460	116 121 128	5	3430	116 121 128	5	3400	116 121 128
	0	3400	116 121 128	0	3370	116 121 128	0	3340	116 121 128

Table PER-23. FLAPS 0˚, 10 KT HEADWIND (SHEET 14 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 210 MPH

WT	20,500			20,000			19,500		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
	40	5350	113 119 125	40	5050	111 118 123	40	4800	108 117 121
	35	4910	111 120 125	35	4660	109 118 123	35	4440	107 116 121
	30	4550	109 119 125	30	4320	107 118 123	30	4130	105 116 122
5,000	25	4230	108 119 125	25	4080	107 118 124	25	4040	107 116 123
	20	4160	109 119 126	20	4110	109 118 124	20	4070	109 116 123
	15	4150	111 119 126	15	4110	111 118 125	15	4060	111 116 124
	10	4140	113 119 127	10	4100	113 118 126	10	4050	113 117 126
	5	4130	115 120 127	5	4090	115 120 127	5	4040	115 121 127
	0	4070	116 121 128	0	4030	116 121 127	0	3990	116 121 128
	42	5090	112 119 125	42	4820	110 118 123	42	4580	108 116 121
	40	4930	111 120 125	40	4670	109 118 123	40	4440	107 116 121
	35	4540	110 119 125	35	4310	108 117 123	35	4110	106 116 122
	30	4210	108 119 125	30	4020	106 118 124	30	3940	106 116 122
4,000	25	4070	109 119 125	25	4030	109 118 124	25	3970	109 116 123
	20	4070	111 119 126	20	4030	111 118 125	20	3990	111 116 124
	15	4100	114 119 127	15	4060	114 118 126	15	4010	114 118 126
	10	4110	116 121 128	10	4070	116 121 128	10	4020	116 121 128
	5	3980	116 121 128	5	3950	116 121 128	5	3920	116 121 128
	0	3910	116 121 128	0	3870	116 121 128	0	3830	116 121 128
	44	4920	112 120 124	44	4640	110 118 123	44	4390	107 116 121
	40	4550	110 119 124	40	4310	108 117 123	40	4110	106 116 121
	35	4200	109 119 124	35	4000	107 117 123	35	3830	105 116 122
	30	3970	108 119 125	30	3930	108 117 124	30	3880	108 116 123
3,000	25	4000	111 119 126	25	3950	111 117 125	25	3900	111 116 123
	20	4000	113 119 126	20	3960	113 117 125	20	3920	113 117 125
	15	4040	116 121 127	15	4000	116 121 127	15	3960	116 121 127
	10	3910	116 121 128	10	3890	116 121 128	10	3840	116 121 128
	5	3840	116 121 128	5	3800	116 121 128	5	3770	116 121 128
	0	3780	116 121 128	0	3740	116 121 128	0	3700	116 121 128

Table PER-23. FLAPS 0˚, 10 KT HEADWIND (SHEET 15 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 210 MPH

WT	20,500			20,000			19,500		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT	OAT °C	DIST FT	V1 VR V2 KT KT KT
	34	6270	114 121 125	34	5920	112 120 123	34	5570	109 118 122
	30	5830	113 121 125	30	5500	110 119 123	30	5210	108 117 122
8,000	25	5370	111 120 125	25	5090	109 119 123	25	4840	107 117 122
	20	5030	110 120 125	20	4780	108 118 123	20	4560	106 117 122
	15	4750	109 120 125	15	4530	107 118 124	15	4320	105 117 123
	10	4500	108 120 126	10	4370	107 118 124	10	4320	107 117 123
	5	4390	109 120 126	5	4340	109 118 125	5	4290	109 117 124
	0	4350	110 119 126	0	4300	110 118 125	0	4260	110 117 124
	36	5940	114 121 125	36	5630	112 119 123	36	5320	109 117 122
	35	5830	113 121 125	35	5520	111 119 123	35	5200	109 117 122
	30	5340	111 120 125	30	5070	109 119 123	30	4810	107 117 122
7,000	25	4950	110 120 125	25	4700	108 118 123	25	4490	106 117 122
	20	4650	109 120 125	20	4430	107 118 124	20	4230	105 117 123
	15	4390	108 119 125	15	4280	107 118 124	15	4230	107 117 123
	10	4320	109 119 126	10	4270	109 118 125	10	4230	109 117 124
	5	4290	111 119 126	5	4240	111 118 125	5	4200	111 117 124
	0	4230	112 119 126	0	4180	112 118 125	0	4140	112 116 124
	38	5620	113 121 125	38	5320	111 119 123	38	5040	109 117 122
	35	5350	112 120 125	35	5060	110 119 123	35	4800	108 117 122
	30	4920	110 120 125	30	4670	108 118 123	30	4450	106 116 122
6,000	25	4580	109 119 125	25	4360	107 118 123	25	4160	105 116 122
	20	4310	108 119 125	20	4200	107 118 124	20	4150	107 117 123
	15	4260	109 119 126	15	4210	109 118 125	15	4170	109 117 124
	10	4240	111 119 126	10	4190	111 118 125	10	4140	111 116 124
	5	4200	113 119 127	5	4150	113 118 125	5	4110	113 117 125
	0	4190	114 119 127	0	4150	114 119 127	0	4100	114 119 127

Table PER-23. FLAPS 0˚, 10 KT HEADWIND (SHEET 16 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 210 MPH

WT	19,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT
2,000	46	3990	105 114 120
	45	3940	105 114 120
	40	3680	104 114 120
	35	3730	107 114 121
	30	3780	110 114 122
	25	3790	113 117 125
	20	3850	116 121 128
	15	3730	116 121 128
	10	3660	116 121 128
	5	3600	116 121 128
	0	3540	116 121 128
1,000	48	3840	105 114 120
	45	3660	104 114 120
	40	3620	106 114 121
	35	3670	109 114 122
	30	3690	111 116 124
	25	3740	115 119 127
	20	3670	116 121 128
	15	3600	116 121 128
	10	3540	116 121 128
	5	3480	116 121 128
	0	3420	116 121 128
SEA LEVEL	50	3690	104 114 120
	45	3520	103 114 120
	40	3580	108 114 121
	35	3610	111 115 123
	30	3660	114 119 126
	25	3600	116 121 128
	20	3530	116 121 128
	15	3480	116 121 128
	10	3420	116 121 128
	5	3370	116 121 128
	0	3310	116 121 128



Table PER-23. FLAPS 0˚, 10 KT HEADWIND (SHEET 17 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 210 MPH

WT	19,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT
5,000	40	4540	106 115 120
	35	4220	105 115 120
	30	3960	104 115 121
	25	4000	107 115 122
	20	4020	109 115 122
	15	4020	111 115 123
	10	4010	113 115 126
	5	4000	115 115 127
	0	3950	116 121 128
4,000	42	4340	105 115 120
	40	4210	105 115 120
	35	3920	104 115 121
	30	3920	106 115 121
	25	3940	109 115 122
	20	3940	111 115 123
	15	3980	116 115 126
	10	4000	116 115 128
	5	3870	116 121 128
	0	3800	116 121 128
3,000	44	4160	105 114 120
	40	3920	104 114 120
	35	3780	105 114 121
	30	3840	108 115 122
	25	3860	111 115 123
	20	3870	113 115 125
	15	3920	116 121 127
	10	3800	116 121 128
	5	3730	116 121 128
	0	3670	116 121 128



Table PER-23. FLAPS 0˚, 10 KT HEADWIND (SHEET 18 OF 18)

LEVEL DRY RUNWAY, APR ON, TIRE SPEED 210 MPH

WT	19,000		
AERODROME ALTITUDE FT	OAT °C	DIST FT	V1 VR V2 KT KT KT
8,000	34	5260	107 116 120
	30	4930	106 115 120
	25	4610	105 115 120
	20	4350	104 115 121
	15	4260	105 115 122
	10	4270	107 115 122
	5	4250	109 115 122
	0	4210	110 115 123
7,000	36	5000	107 115 120
	35	4920	106 115 120
	30	4570	105 115 120
	25	4280	104 115 121
	20	4160	105 115 121
	15	4180	107 115 122
	10	4180	109 115 122
	5	4150	111 115 123
	0	4090	112 116 124
6,000	38	4760	106 115 120
	35	4540	106 115 120
	30	4240	104 115 121
	25	4070	105 115 121
	20	4100	107 115 122
	15	4120	109 115 122
	10	4100	111 115 124
	5	4070	113 117 125
	0	4060	114 119 127

ENROUTE DATA

INTRODUCTION

This section contains data for use in ensuring compliance with the operating regulations relating to enroute flight.

ENROUTE NET GRADIENT OF CLIMB (ONE ENGINE OPERATIVE)

The enroute net climb gradient with one engine inoperative is shown on Figure PER-67 (*AFM* Figure 5.40.1) for varying weight, altitude and air temperature.

Associated Conditions

Refer to Table PER-24.

Table PER-24. ASSOCIATED CONDITIONS FOR ENROUTE DATA

ENGINES	ONE ENGINE OPERATING AT MAXIMUM CONTINUOUS THRUST
ENGINE BLEED AIR	AIR CONDITIONING BLEED ON; SEE BELOW FOR THE EFFECT OF ENGINE ANTI-ICE BLEED
FLAPS	0°
LANDING GEAR	UP
AIRSPEED	ENROUTE CLIMB SPEED GIVEN BY FIGURE PER-13 EXCEPT IN ICING CONDITIONS, AIRSPEED IS INCREASED TO THE MINIMUM AS SHOWN IN THE GRAPH **SPEED FOR USE IN ICING CONDITIONS**, SUBSECTION 4.10 OF THE *AFM* (FIGURE PER-6)

Instructions for Use of Chart

The use of the chart is illustrated by the arrowed broken lines.

- Enter the chart with air temperature and move up to the appropriate altitude curve.
- Proceed horizontally to the weight correction reference line and then follow the guidelines to the required weight.
- If the engine anti-ice system is OFF then pass through the reference line and read net gradient from the right hand scale.
- If the engine anti-ice system is ON then follow the guidelines from the engine anti-ice reference line down to the anti-ice ON position and then read net gradient from the right hand scale.

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PREFLIGHT

WORKED EXAMPLE

The pages that follow contain a worked example using the FUEL LOADING PLAN (Figure PER-68). The example is based on the flight profile given in Figure PER-69. The reader is progressively guided through the parts of the FUEL LOADING PLAN with text describing each part before moving to the next part.

DATA

The data used for the worked example is listed below.

Departure airfield
- Elevation ..... 2,000 ft
- Runway length..... 5,800 ft dry
- Runway slope ..... zero
- No clearway, stopway or obstacles
- Temperature ..... 66°F
- Wind component..... zero

Distance to destination..... 1,900 nm
Enroute wind ..... 20 kt tailwind
Enroute temperature..... ISA +5°C
High speed procedure required

Destination airfield
- Elevation ..... 2,000 ft
- Runway length..... 4,350 ft dry
- Runway slope ..... zero
- Temperature ..... 77°F
- Wind component..... zero

Holding allowance ..... 30 minutes at 5,000 ft ISA +5°C
Diversion
- Distance ..... 120 nm
- Wind..... 20 kt headwind
- Temperature ..... ISA +5°C

Alternate airfield
- Elevation..... Sea Level
- Runway length..... 4,000 ft dry
- Runway slope ..... zero
- Temperature ..... 86°F
- Wind component ..... 10 kt headwind

Payload..... 4 passengers plus 120 lb baggage

Trip Date: ..... From: ..... Destination: ..... Alternate: .....

Part 1 PERMISSIBLE WEIGHTS lb (from AFM)

Permissible Take-off Weight	APR 'ON'	(1)
Permissible Landing Weight	DESTINATION	(2)
	ALTERNATE	(3)
Maximum Zero Fuel Weight		(4)

Part 2 ZERO FUEL WEIGHT lb

Operating Weight (from Weight and Balance Manual)	
Passengers (No. of Pax x standard weight allowance)	
Baggage	
Zero Fuel Weight (check does not exceed (4)).	(5)

Part 3a FLIGHT PLAN DISTANCES

Sector Distance nm	(6)	**Diversion** Distance nm	(8)
Still Air Time min.	(7)	Still Air Time min.	(9)
Mean Still Air Speed= 60 x (6) / (7)		Mean Still Air Speed= 60 x (8) / (9)	
Equivalent Sector Still Air Distance nm		Equivalent Diversion Still Air Distance nm	

Part 3b FLIGHT PLAN Weights lb Times min and fuels lb

Zero Fuel Weight (5)	
Approach fuel	(10)
Taxi-in fuel	
Diversion Arrival Weight	
Diversion fuel	(11)
Weight at end of Hold	
Holding fuel for min. at altitude.	(12)
Additional fuel Reserves (if required)	
Destination Arrival Weight	

Interpolation 'scratchpad'

ISA Arr. wt ⇨	Time / Fuel	Time / Fuel	⇦ ISA Arr. wt
Interpolation values			Interpolated at
ISA Arr. wt ⇨	Time / Fuel	Time / Fuel	⇦ ISA Arr. wt

Sector Time		Sector Fuel	(13)
Take-off Weight			(14)

FUEL LOADING PLAN

Part 4 FUEL SUMMARY

Approach. (10)	
Taxi-in	
Diversion (11)	
Holding (12)	
Additional Reserves (if required)	
Sector (13)	
Taxi-out	
TOTAL FUEL REQUIRED (15)	

Part 5 LOADING CHECK (optional)

Zero Fuel Weight (5)		Values must not exceed:	
Total Fuel required (15)			
RAMP WEIGHT (5) + (15)		28120 lb	
Taxi-out fuel			(1)
ACTUAL TAKE-OFF WEIGHT Should equal (14)			
Fuel to Destination (10) + (13)	(16)		
DESTINATION LANDING WEIGHT (14) - (16)	(17)		(2)
Diversion fuel (11)			
LANDING WEIGHT AT ALTERNATE (17) - (11)			(3)

Figure PER-68. Fuel Loading Plan Worksheet

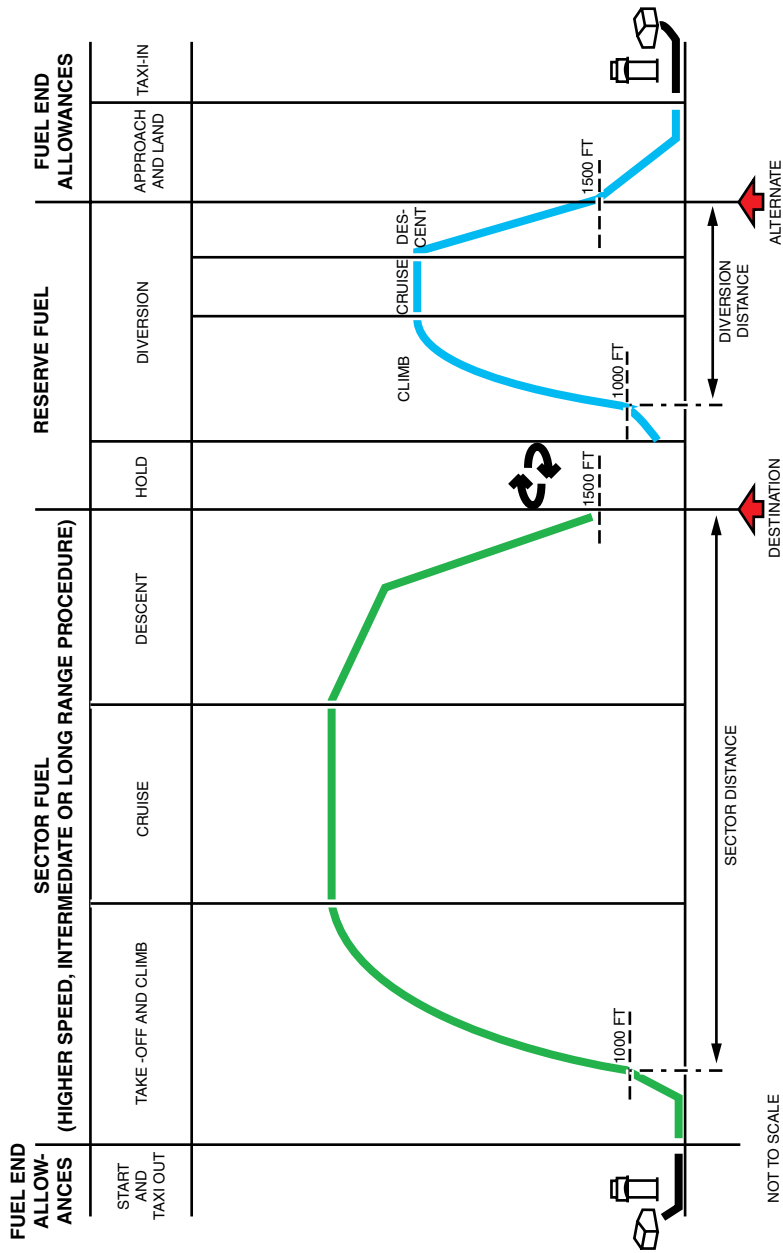


Figure PER-69. Phases of Flight Nomenclature

CALCULATION

Part 1 Permissible Weights (from *AFM*)

Permissible Takeoff Weight

$$\text{Temperature } ^\circ\text{C} = \frac{5}{9}\left(^\circ\text{F-32}\right) = 19^\circ\text{C}$$

Since there are no obstacles, the permissible takeoff weight will be the lowest of the following:

- Maximum takeoff weight from *AFM*, Section 2, equaling 28,000 lb
- WAT limited weight from *AFM*, Subsection 5.15 (Figures PER-16–PER-18)
- Field length limited weight from *AFM*, Subsection 5.20 (Figures PER-19–PER-51)

From *AFM* Subsection 5.15 for departure airfield, it can be seen that the WAT and tire speed limits at both flap settings are greater than 28,000 lb.

From *AFM* Subsection 5.20, Assuming Flaps 15°:

- TODA=ASDA ..... 5,800 ft
- Lowest D value ..... 5,800 ft
- Takeoff weight ..... 28,352 lb
- Minimum values of V_1, V_R and V_2 are not limiting.

Permissible takeoff weight is therefore ***28,000 lb***.

Permissible Landing Weight at Destination

$$\text{Temperature } ^\circ\text{C} = \frac{5}{9}\left(77\text{-}32\right) = 25^\circ\text{C}$$

From *AFM*, Section 2, maximum landing weight equals 23,350 lb.

From *AFM*, Subsection 5.45 (Figure PER-63), landing WAT limit equals 25, 170 lb.

From *AFM*, Subsection 5.50 (Figure PER-64), the maximum weight for a landing field length limited of 4,350 ft equals 21,500 lb.

Permissible landing weight at the destination is therefore the lowest of these three weights, i.e., ***21,500 lb***.

Permissible Landing Weight at Alternate

- Temperature..... 86°F (30°C)
- Maximum landing weight ..... 23,350 lb
- WAT limitation..... 25,930 lb
- Field length limitation ..... 22,350 lb

Permissible landing weight at alternate equals ***22,350 lb***.

Maximum zero fuel weight (from *AFM*, Section 2) equals ***18,450 lb***.

Part 1 of the FUEL LOADING PLAN can now be completed as shown in Table PER-25.

Table PER-25. FUEL LOADING PLAN—PART 1

Part 1 PERMISSIBLE WEIGHTS lb (from AFM)			
Permissible Takeoff Weight	APR 'ON'	28,000	①
Permissible Landing Weight	DESTINATION	21,500	②
	ALTERNATE	22,350	③
Maximum Zero Fuel Weight		18,450	④



Part 2 Zero Fuel Weight

Data for this par is obtained from the *Weight and Balance Manual*.

Operating Weight

A typical operating weight is defined in the *Weight and Balance Manual* and consists of the basic weight stated at the beginning of the Weight and CG Schedule plus the following items:

- All fluids
- Lifejackets and dinghies (if carried)
- Food and drink
- Passenger service items
- Crew with manuals and baggage

The typical operating weight corrected for any unknown variations to the above items may be ***16,100 lb***.

Passengers

The standard weight allowance is 170 lb per passenger:

$$4 \times 170 = \textbf{\textit{680 lb}}$$

Baggage weight may be weighed or estimated at ***120 lb***.

Zero Fuel Weight, the sum of the operating weight, passengers, and baggage, is ***16,900 lb***.

This is less than the maximum zero fuel weight of 18,450 lb (4) already obtained from the *AFM*.

The FMS may be used to calculate zero fuel weight, using the procedure given below:

1. Select the FUEL page 1 which is the fuel and weight entry page. This will display the EMPTY WT used for the last flight.
2. Enter number of passengers at the PAX line and the baggage weight at the CARGO line.
3. The ZERO FUEL WEIGHT (ZFW) is automatically calculated based on these three prior entries.

Part 2 of the FUEL LOADING PLAN may now be completed (Table PER-26).

Table PER-26. FUEL LOADING PLAN—PART 2

Part 2 ZERO FUEL WEIGHT lb	
Operating Weight (from *Weight and Balance Manual*)	16,100
Passengers (No. of Pax x standard weight allowance)	680
Baggage	120
Zero Fuel Weight (= sum of above) (Check does not exceed ④)	16,900 ⑤

Part 3a Flight Plan Distances

If there is a headwind or tail wind component, then an equivalent still air distance (ESAD) must be estimated for the sector from the departure airfield to the destination, and for diversion from the destination to the alternate airfield.

An approximate still airspeed is first determined and then knowing the actual distance, wind and mean speed, the equivalent distances may be obtained from the tables shown later in this section.

Equivalent Sector Distance

Obtain an approximate still air sector time from the tables for an appropriate procedure (High Speed, Intermediate, or Long Range) assuming a reserve fuel of 2,000 lb to give an approximate weight.

For this example, we shall use the high speed sector data for ISA conditions (an acceptable approximation to ISA +5°C) and an approximate arrival weight of 16, 900 lb + 2,000 lb = 18,900 lb.

This gives a sector time for 1,900 nm of about ***270*** minutes at the highest achievable cruise altitude of 39,000 ft.

Mean sector speed is calculated:

$$\frac{60 \times 1{,}900}{270} = \textbf{\textit{422 kt}}$$

The ESAD is ***1,814 nm*** by interpolation between the 400 kt and 450 kt tables at a sector distance of 1,900 nm and a tailwind of 20 kt (*Crew Manual* [*CM*] 2-1-2 pages 12–13 and 16–17 or Tables PER 33 and PER-35).



Equivalent Diversion Distance

The ESAD for the diversion is obtained in a similar way using zero fuel weight plus approach and landing fuel as the arrival weight.

In this case, we shall choose an altitude of 15,000 ft on the basis of the approximate rule of assuming 10,000 ft altitude per 80 nm of diversion distance. This ensures that cruise distance will be at least half the total distance. (A lower diversion fuel could be achieved by assuming climb to a higher altitude and a shorter cruise.)

From *CM* 2-1-6 pages 2–3 (or Table PER-39) concerning arrival weight of 17,000 lb and 15,000 ft cruise altitude, we see that time is ***28*** minutes for a diversion distance of 120 nm.

Mean still airspeed is calculated:

$$\frac{60 \times 120}{28} = \textbf{257 kt}$$

If we use the conservative rule of assuming 50% actual tailwind component or 150% headwind component, then ground speed will be 30 kt less than this.

$$\text{ESAD} = \text{DISTANCE} \times \frac{\text{MEAN STILL AIRSPEED}}{\text{GROUND SPEED}}$$

$$= 120 \times \frac{257}{227}$$

$$= \textbf{\textit{136 nm}}$$

Part 3a of the FUEL LOADING PLAN may now be completed (Table PER-27).

Table PER-27. FUEL LOADING PLAN 3a

Part 3a FLIGHT PLAN DISTANCES			
Sector Distance nm	1,900 ⑥	**Diversion** Distance nm	120 ⑧
Still Air Time min.	270 ⑦	Still Air Time min.	28 ⑨
Mean Still Airspeed kt = 60 x ⑥ / ⑦	422	Mean Still Airspeed kt = 60 x ⑧ / ⑨	257
Equivalent Sector Still Air Distance nm	1,814	Equivalent Sector Still Air Distance nm	136

Part 3b Flight Plan Fuels and Times

The total fuel quantity required is built up starting at the zero fuel weight and moving through the flight profile (Figure PER-69) in the reverse direction adding fuel for each phase until a takeoff weight is obtained.

- Zero fuel weight (already determined)..... 16,900 lb
- Approach, land, and taxi-in ..... 150 lb
- Add to give Diversion arrival weight/Diversion fuel..... 17,050 lb

Diversion distance and altitude—136nm at 15,000 ft:

- For 17,000 lb arrival weight..... 740 lb fuel
- For 20,000 lb arrival weight..... 778 lb fuel
- For 17,050 lb arrival weight..... 741 lb fuel

NOTE

This fuel may be reduced by 30 lb because the airfield at the start of the diversion is at 2,000 ft altitude.

- Diversion arrival weight ..... 17,050 lb
- Diversion fuel required ..... ***711*** lb
- Weight at end of holding 17,761

Holding fuel flow at 5,000 ft, ISA, at mean weight of 18,100 lb equals 1,110 lb per hour (anti-ice OFF).

Add 25 pph for ISA +5°C equals 1,135 lb.

- Weight at end of holding..... 17,761 lb
- Holding fuel for 30 minutes..... ***568*** lb
- Weight at start of hold ..... ***18, 329*** lb

NOTE

At this point, any other reserves may be added if required (i.e., a second approach allowance, or enroute allowance, etc.). Destination arrival weight will include these extra reserves.

Sector time and fuel for the ESAD of 1,814 nm should be read from the Sector Time and Fuel tables for temperatures and arrival weights above and below those required. The Interpolation "scratchpad" portion of the FUEL LOADING PLAN is provided to facilitate interpolation (Table PER-28).

High Speed Sector Time and Fuel: Cruise at 39,000 ft.

For the required arrival weight of 18,329 lb the values will be:

- Time ..... 257 minutes
- Fuel..... 6,815 pounds

Table PER-28. FUEL LOADING PLAN—PART 3b

Part 3b FLIGHT PLAN Weights (lb) Times (min.) and fuels (lb)	
Zero Fuel Weight (5)	16,900
Approach Fuel	100 (10)
Taxi-in Fuel	50
Diversion Arrival Weight	17,050
Diversion Fuel	711 (11)
Weight at end of Hold	17,761
Holding fuel for 30 min. at 5,000 ft altitude.	568 (12)
Additional Fuel Reserves (If Required)	0
Destination Arrival Weight	18,329

Interpolation "Scratchpad"			
ISA ⇨ Arr. wt 17,000	Time 254 Fuel 7,040	Time 260 Fuel 7,182	ISA Arr. wt ⇦ 20,000
ISA 5 C 17,000	Time 254 Fuel 6,733	Time 260.5 Fuel 6,919	ISA 5 C 20,000
ISA 10 C Arr. wt 17,000 ⇨	Time 254 Fuel 6,426	Time 261 Fuel 6,655	ISA 10 C Arr. wt ⇦ 20,000

Sector Time	257 min.	Sector Fuel	6,785 lb (13)
		Takeoff Weight	25,114 lb (14)

NOTE

This fuel may be reduced by 30 lb because the departure airfield is at 2,000 ft altitude.

Takeoff weight equals 18,329 + 6,785 = ***25,114*** lb.

Parts 3b, 4, and 5 of the FUEL LOADING PLAN can now be completed (Tables PER-28 and 29).

Table PER-29. FUEL LOADING PLAN—PARTS 4 and 5

Part 4 FUEL SUMMARY	
Approach (10)	100 lb
Taxi-in	50 lb
Diversion (11)	711 lb
Holding (12)	568 lb
Additional Reserves (If Required)	0
Sector (13)	6,785 lb
Taxi-out	100 lb
Destination Arrival Weight	8,314 lb (15)

Part 5 LOADING CHECK (optional)		
Zero Fuel Weight (5)	16,900	Values must not exceed:
Total Fuel Required (15)	8,314	
RAMP WEIGHT (5) + (15)	25,214	28120 lb
Taxi-out Fuel	100	(1) 28,000
ACTUAL TAKEOFF WEIGHT Should equal (14)	25,114	
Fuel to Destination (10) + (13)	6,885 (16)	
DESTINATION LANDING WEIGHT (14) − (16)	18,229 (17)	21,500 (2)
Diversion Fuel (11)	711	
LANDING WEIGHT AT ALTERNATE (17) − (11)	17,518	22,350 (3)

ESAD AND ALLOWANCES

EQUIVALENT STILL AIR DISTANCE (ESAD)

When a Sector or Diversion is to be flown in other than zero wind conditions, it will be necessary to estimate an equivalent still air distance (ESAD) for purposes of determining the fuel required.

ESAD values may be determined from the tables in this section, or calculated from the formula:

$$\text{ESAD} = \text{DISTANCE} \times \frac{\text{MEAN STILL AIRSPEED}}{\text{AIRSPEED} - \text{WIND}}$$

In this section, the following conventions will be used:

- Distances in nautical miles
- Airspeeds and wind components in knots
- Airspeed equaling cruise true airspeed or the mean still air sector speed in knots
- Headwinds positive and tailwinds negative

Tables PER-30 through PER-36 in this section give ESAD values over a range of sector distances for headwinds and tailwinds of up to 160 knots. Data is provided for true airspeed values of 350, 400, and 450 knots. Cruise true airspeeds may be determined from the sector distance divided by the still air sector time (Tables PER-36 through PER-38):

$$\text{CRUISE TRUE AIRSPEED} = \frac{\text{SECTOR DISTANCE}}{\text{STILL AIR SECTOR TIME}}$$

Crosswinds

Even with no headwind or tailwind component, the ESAD will be greater than sector distance if there is a high crosswind.

Increase ESAD if the conditions below apply:

- Windspeed (irrespective of component) > 10% of aircraft speed and either of the following:
  - Crosswind > tailwind component
  - Crosswind > 50% of headwind component

- ESAD should be increased above the values read from the table or calculated from the formula by the following amounts:

WINDSPEED					
AIRCRAFT TRUE AIRSPEED	≤0.1	0.2	0.3	0.4	0.5
INCREASE IN ESAD	ZERO	+1%	+3%	+6%	+12%

END ALLOWANCES

The following fuel allowances may be used:

- Engine start ..... 20 lb for both engines
- Taxi ..... 10 lb per minute pretakeoff or post landing

A typical pretakeoff allowance is 100 lb for start and taxi-out, but considerably more may be needed at some airfields. Pretakeoff fuel must be allowed for when calculating the total fuel required, but it is not included in the takeoff weight.

NOTE

Takeoff weight plus pretakeoff fuel must not exceed the maximum ramp weight.

- Approach
  - Visual flight rules (VFR)..... 30 lb
  - Instrument flight rules (IFR) ..... 100 lb
- Circuits
  - Approximately 2,000 pph, with flaps 15° and landing gear extended

OPERATION FROM/TO HIGH ALTITUDE AIRFIELDS

The sector fuel tables are based on takeoff and landing at sea level. If takeoff is made from a higher airfield then sector fuel may be reduced by 15 lb per 1,000 feet airfield altitude. This allows fro the shorter climb to cruise altitude and the corresponding longer cruise, giving the same sector distance.

Landing at a high altitude airfield has no significant effect on sector fuel.



RESERVE FUEL

Diversion

Diversion fuel can be read from Tables PER-39 through PER-41 (*CM* 2-1-6 pages 2–7). These include an allowance of approximately 50 lb (varying) with weight) which may be used to cover a discontinued approach and climb to 1,000 ft.

The minimum distance shown in the table of a given altitude may consist.only of takeoff, climb, and descent with no appreciable cruise. It will sometimes be possible to use this altitude for a diversion but it may be necessary to plan for a lower altitude.

Diversion at cruising altitude should be dealt with by adding the appropriate diversion air distance to the sector air distance before entering the sector fuel table.

Holding

Holding fuel for any required period is calculated from the fuel flows in *CM* subsection 2-1-7 pages 2–3 of the *Performance Manual* (Tables PER-45 and PER-46). Allowance is made in the table for the increase in drag due to flying circuits using 25° bank.

A typical holding allowance at the alternate is 30 minutes at low altitude or 45 minutes higher up. In most cases, this will be sufficient to cover landing at the alternate, but an additional approach allowance may be added if required.

NOTE

An overshoot must not be attempted with less than 400 lb of fuel in the tanks.

Additional Holding Allowance

On some routes, an additional holding allowance will be needed at the destination.

Enroute Allowance

A contingency allowance, usually in the form of a sector fuel percentage, may be added to the reserves. A typical figure is 5%.

CAUTION

As a rough guide: **Total NBAA IFR reserve fuel** (including 200 nm diversion and 35 minutes holding at 5,000 ft) will be 1,500 lb for a zero fuel weight of approximately 17,500 lb.

ICING CONDITIONS

- Climb—The effect of climbing through a 10,000 feet icing layer is to increase the normal climb time by up to 1.5 minutes.

  The effect on sector fuel and time does not exceed 50 lb or one minute.

- Cruise—Fuel flow is increased by approximately 100 pph up to 25,000 feet and by approximately 150 pph at higher altitudes.

- Descent—The penalty in fuel for descending through a 10,000 feet icing layer is 100 lb. There is no significant effect on distance.

SECTOR TIME AND FUEL

Refer to Tables PER-36 through PER-38 (*CM* 2-1-3 pages 32–37).

DIVERSION TIME AND FUEL

This section contains tabulated data for diversion times and fuels versus diversion distance and diversion cruise altitude. Tables PER-42 through PER-43 cover a range of arrival weights for ISA conditions; however, they also may be used for other temperatures since the effect of temperature on diversion times and fuel is negligible.

Diversion times and fuels have been calculated using the Long Range procedure. They include fuel and time allowances for discontinued approach and climb to 1,000 ft, which are similar to those assumed for takeoff and initial climb in the "Sector Time and Fuel" tables. Therefore, the diversion tables also may be used to determine sector time and fuels using the Long Range procedure for short sectors.

NORMAL CLIMB

Refer to Table PER-47 (*CM* 2-3-1 pages 6–7).

HIGH SPEED CRUISE

Refer to Tables PER-47 through PER-48 (*CM* 2-4-1 pages 15–18).

Table PER-30. EQUIVALENT STILL AIR DISTANCE—350 kt TAS AND SECTOR DISTANCE 50–1,200 nm (SHEET 1 OF 2)

SECT DIST	HEADWIND kt												
nm	160	140	120	100	90	80	70	60	50	40	30	20	10
50	92	83	76	70	67	65	63	60	58	56	55	53	51
100	184	167	152	140	135	130	125	121	117	113	109	106	103
150	276	250	228	210	202	194	188	181	175	169	164	159	154
200	368	333	304	280	269	259	250	241	233	226	219	212	206
250	461	417	380	350	337	324	313	302	292	282	273	265	257
300	553	500	457	420	404	389	375	362	350	339	328	318	309
350	645	583	533	490	471	454	438	422	408	395	383	371	360
400	737	667	609	560	538	519	500	483	467	452	438	424	412
450	829	750	685	630	606	583	563	543	525	508	492	477	463
500	921	833	761	700	673	648	625	603	583	565	547	530	515
550	1013	917	837	770	740	713	688	664	642	621	602	583	566
600	1105	1000	913	840	808	778	750	724	700	677	656	636	618
650	1197	1083	989	910	875	843	813	784	758	734	711	689	669
700	1289	1167	1065	980	942	907	875	845	817	790	766	742	721
750	1382	1250	1141	1050	1010	972	938	905	875	847	820	795	772
800	1474	1333	1217	1120	1077	1037	1000	966	933	903	875	848	824
850	1566	1417	1293	1190	1144	1102	1063	1026	992	960	930	902	875
900	1658	1500	1370	1260	1212	1167	1125	1086	1050	1016	984	955	926
950	1750	1583	1446	1330	1279	1231	1188	1147	1108	1073	1039	1008	978
1000	1842	1667	1522	1400	1346	1296	1250	1207	1167	1129	1094	1061	1029
1050	1934	1750	1598	1470	1413	1361	1313	1267	1225	1185	1148	1114	1081
1100	2026	1833	1674	1540	1481	1426	1375	1328	1283	1242	1203	1167	1132
1150	2118	1917	1750	1610	1548	1491	1438	1388	1342	1298	1258	1220	1184
1200	2211	2000	1826	1680	1615	1556	1500	1448	1400	1355	1313	1273	1235



Table PER-30. EQUIVALENT STILL AIR DISTANCE—350 kt TAS AND SECTOR DISTANCE 50–1,200 nm (SHEET 2 OF 2)

TAILWIND kt													SECT DIST
10	20	30	40	50	60	70	80	90	100	120	140	160	nm
49	47	46	45	44	43	42	41	40	39	37	36	34	50
97	95	92	90	88	85	83	81	80	78	74	71	69	100
146	142	138	135	131	128	125	122	119	117	112	107	103	150
194	189	184	179	175	171	167	163	159	156	149	143	137	200
243	236	230	224	219	213	208	203	199	194	186	179	172	250
292	284	276	269	263	256	250	244	239	233	223	214	206	300
340	331	322	314	306	299	292	285	278	272	261	250	240	350
389	378	368	359	350	341	333	326	318	311	298	286	275	400
438	426	414	404	394	384	375	366	358	350	335	321	309	450
486	473	461	449	438	427	417	407	398	389	372	357	343	500
535	520	507	494	481	470	458	448	438	428	410	393	377	550
583	568	553	538	525	512	500	488	477	467	447	429	412	600
632	615	599	583	569	555	542	529	517	506	484	464	446	650
681	662	645	628	613	598	583	570	557	544	521	500	480	700
729	709	691	673	656	640	625	610	597	583	559	536	515	750
778	757	737	718	700	683	667	651	636	622	596	571	549	800
826	804	783	763	744	726	708	692	676	661	633	607	583	850
875	851	829	808	788	768	750	733	716	700	670	643	618	900
924	899	875	853	831	811	792	773	756	739	707	679	652	950
972	946	921	897	875	854	833	814	795	778	745	714	686	1000
1021	993	967	942	919	896	875	855	835	817	782	750	721	1050
1069	1041	1013	987	963	939	917	895	875	856	819	786	755	1100
1118	1088	1059	1032	1006	982	958	936	915	894	856	821	789	1150
1167	1135	1105	1077	1050	1024	1000	977	955	933	894	857	824	1200



Table PER-31. EQUIVALENT STILL AIR DISTANCE—350 kt TAS AND SECTOR DISTANCE 1,200–2,500 nm (SHEET 1 OF 2)

SECT DIST nm	HEADWIND kt ← 160	140	120	100	90	80	70	60	→ 50	40	30	20	10
1250	2303	2083	1902	1750	1683	1620	1563	1509	1458	1411	1367	1326	1287
1300	2395	2167	1978	1820	1750	1685	1625	1569	1517	1468	1422	1379	1338
1350	2487	2250	2054	1890	1817	1750	1688	1629	1575	1524	1477	1432	1390
1400	2579	2333	2130	1960	1885	1815	1750	1690	1633	1581	1531	1485	1441
1450	2671	2417	2207	2030	1952	1880	1813	1750	1692	1637	1586	1538	1493
1500	2763	2500	2283	2100	2019	1944	1875	1810	1750	1694	1641	1591	1544
1550	2855	2583	2359	2170	2087	2009	1938	1871	1808	1750	1695	1644	1596
1600	2947	2667	2435	2240	2154	2074	2000	1931	1867	1806	1750	1697	1647
1650	3039	2750	2511	2310	2221	2139	2063	1991	1925	1863	1805	1750	1699
1700	3132	2833	2587	2380	2288	2204	2125	2052	1983	1919	1859	1803	1750
1750	3224	2917	2663	2450	2356	2269	2188	2112	2042	1976	1914	1856	1801
1800	3316	3000	2739	2520	2423	2333	2250	2172	2100	2032	1969	1909	1853
1850	3408	3083	2815	2590	2490	2398	2313	2233	2158	2089	2023	1962	1904
1900	3500	3167	2891	2660	2558	2463	2375	2293	2217	2145	2078	2015	1956
1950	3592	3250	2967	2730	2625	2528	2438	2353	2275	2202	2133	2068	2007
2000	3684	3333	3043	2800	2692	2593	2500	2414	2333	2258	2188	2121	2059
2050	3776	3417	3120	2870	2760	2657	2563	2474	2392	2315	2242	2174	2110
2100	3868	3500	3196	2940	2827	2722	2625	2534	2450	2371	2297	2227	2162
2150	3961	3583	3272	3010	2894	2787	2688	2595	2508	2427	2352	2280	2213
2200	4053	3667	3348	3080	2962	2852	2750	2655	2567	2484	2406	2333	2265
2250	4145	3750	3424	3150	3029	2917	2813	2716	2625	2540	2461	2386	2316
2300	4237	3833	3500	3220	3096	2981	2875	2776	2683	2597	2516	2439	2368
2350	4329	3917	3576	3290	3163	3046	2938	2836	2742	2653	2570	2492	2419
2400	4421	4000	3652	3360	3231	3111	3000	2897	2800	2710	2625	2545	2471
2450	4513	4083	3728	3430	3298	3176	3063	2957	2858	2766	2680	2598	2522
2500	4605	4167	3804	3500	3365	3241	3125	3017	2917	2823	2734	2652	2574



Table PER-31. EQUIVALENT STILL AIR DISTANCE—350 kt TAS AND SECTOR DISTANCE 1,200–2,500 nm (SHEET 2 OF 2)

TAILWIND kt													SECT DIST
10	20	30	40	50	60	70	80	90	100	120	140	160	nm
1215	1182	1151	1122	1094	1067	1042	1017	994	972	931	893	858	1250
1264	1230	1197	1167	1138	1110	1083	1058	1034	1011	968	929	892	1300
1313	1277	1243	1212	1181	1152	1125	1099	1074	1050	1005	964	926	1350
1361	1324	1289	1256	1225	1195	1167	1140	1114	1089	1043	1000	961	1400
1410	1372	1336	1301	1269	1238	1208	1180	1153	1128	1080	1036	995	1450
1458	1419	1382	1346	1313	1280	1250	1221	1193	1167	1117	1071	1029	1500
1507	1466	1428	1391	1356	1323	1292	1262	1233	1206	1154	1107	1064	1550
1556	1514	1474	1436	1400	1366	1333	1302	1273	1244	1191	1143	1098	1600
1604	1561	1520	1481	1444	1409	1375	1343	1313	1283	1229	1179	1132	1650
1653	1608	1566	1526	1488	1451	1417	1384	1352	1322	1266	1214	1167	1700
1701	1655	1612	1571	1531	1494	1458	1424	1392	1361	1303	1250	1201	1750
1750	1703	1658	1615	1575	1537	1500	1465	1432	1400	1340	1286	1235	1800
1799	1750	1704	1660	1619	1579	1542	1506	1472	1439	1378	1321	1270	1850
1847	1797	1750	1705	1663	1622	1583	1547	1511	1478	1415	1357	1304	1900
1896	1845	1796	1750	1706	1665	1625	1587	1551	1517	1452	1393	1338	1950
1944	1892	1842	1795	1750	1707	1667	1628	1591	1556	1489	1429	1373	2000
1993	1939	1888	1840	1794	1750	1708	1669	1631	1594	1527	1464	1407	2050
2042	1986	1934	1885	1838	1793	1750	1709	1670	1633	1564	1500	1441	2100
2090	2034	1980	1929	1881	1835	1792	1750	1710	1672	1601	1536	1475	2150
2139	2081	2026	1974	1925	1878	1833	1791	1750	1711	1638	1571	1510	2200
2188	2128	2072	2019	1969	1921	1875	1831	1790	1750	1676	1607	1544	2250
2236	2176	2118	2064	2013	1963	1917	1872	1830	1789	1713	1643	1578	2300
2285	2223	2164	2109	2056	2006	1958	1913	1869	1828	1750	1679	1613	2350
2333	2270	2211	2154	2100	2049	2000	1953	1909	1867	1787	1714	1647	2400
2382	2318	2257	2199	2144	2091	2042	1994	1949	1906	1824	1750	1681	2450
2431	2365	2303	2244	2188	2134	2083	2035	1989	1944	1862	1786	1716	2500



Table PER-32. EQUIVALENT STILL AIR DISTANCE—400 kt TAS AND SECTOR DISTANCE 50–1,350 nm (SHEET 1 OF 2)

SECT DIST nm	HEADWIND kt ←								→				
	160	140	120	100	90	80	70	60	50	40	30	20	10
50	83	77	71	67	65	63	61	59	57	56	54	53	51
100	167	154	143	133	129	125	121	118	114	111	108	105	103
150	250	231	214	200	194	188	182	176	171	167	162	158	154
200	333	308	286	267	258	250	242	235	229	222	216	211	205
250	417	385	357	333	323	313	303	294	286	278	270	263	256
300	500	462	429	400	387	375	364	353	343	333	324	316	308
350	583	538	500	467	452	438	424	412	400	389	378	368	359
400	667	615	571	533	516	500	485	471	457	444	432	421	410
450	750	692	643	600	581	563	545	529	514	500	486	474	462
500	833	769	714	667	645	625	606	588	571	556	541	526	513
550	917	846	786	733	710	688	667	647	629	611	595	579	564
600	1000	923	857	800	774	750	727	706	686	667	649	632	615
650	1083	1000	929	867	839	813	788	765	743	722	703	684	667
700	1167	1077	1000	933	903	875	848	824	800	778	757	737	718
750	1250	1154	1071	1000	968	938	909	882	857	833	811	789	769
800	1333	1231	1143	1067	1032	1000	970	941	914	889	865	842	821
850	1417	1308	1214	1133	1097	1063	1030	1000	971	944	919	895	872
900	1500	1385	1286	1200	1161	1125	1091	1059	1029	1000	973	947	923
950	1583	1462	1357	1267	1226	1188	1152	1118	1086	1056	1027	1000	974
1000	1667	1538	1429	1333	1290	1250	1212	1176	1143	1111	1081	1053	1026
1050	1750	1615	1500	1400	1355	1313	1273	1235	1200	1167	1135	1105	1077
1100	1833	1692	1571	1467	1419	1375	1333	1294	1257	1222	1189	1158	1128
1150	1917	1769	1643	1533	1484	1438	1394	1353	1314	1278	1243	1211	1179
1200	2000	1846	1714	1600	1548	1500	1455	1412	1371	1333	1297	1263	1231
1250	2083	1923	1786	1667	1613	1563	1515	1471	1429	1389	1351	1316	1282
1300	2167	2000	1857	1733	1677	1625	1576	1529	1486	1444	1405	1368	1333
1350	2250	2077	1929	1800	1742	1688	1636	1588	1543	1500	1459	1421	1385

Table PER-32. EQUIVALENT STILL AIR DISTANCE—400 kt TAS AND SECTOR DISTANCE 50–1,350 nm (SHEET 2 OF 2)

TAILWIND kt													SECT DIST
10	20	30	40	50	60	70	80	90	100	120	140	160	nm
49	48	47	45	44	43	43	42	41	40	38	37	36	50
98	95	93	91	89	87	85	83	82	80	77	74	71	100
146	143	140	136	133	130	128	125	122	120	115	111	107	150
195	190	186	182	178	174	170	167	163	160	154	148	143	200
244	238	233	227	222	217	213	208	204	200	192	185	179	250
293	286	279	273	267	261	255	250	245	240	231	222	214	300
341	333	326	318	311	304	298	292	286	280	269	259	250	350
390	381	372	364	356	348	340	333	327	320	308	296	286	400
439	429	419	409	400	391	383	375	367	360	346	333	321	450
488	476	465	455	444	435	426	417	408	400	385	370	357	500
537	524	512	500	489	478	468	458	449	440	423	407	393	550
585	571	558	545	533	522	511	500	490	480	462	444	429	600
634	619	605	591	578	565	553	542	531	520	500	481	464	650
683	667	651	636	622	609	596	583	571	560	538	519	500	700
732	714	698	682	667	652	638	625	612	600	577	556	536	750
780	762	744	727	711	696	681	667	653	640	615	593	571	800
829	810	791	773	756	739	723	708	694	680	654	630	607	850
878	857	837	818	800	783	766	750	735	720	692	667	643	900
927	905	884	864	844	826	809	792	776	760	731	704	679	950
976	952	930	909	889	870	851	833	816	800	769	741	714	1000
1024	1000	977	955	933	913	894	875	857	840	808	778	750	1050
1073	1048	1023	1000	978	957	936	917	898	880	846	815	786	1100
1122	1095	1070	1045	1022	1000	979	958	939	920	885	852	821	1150
1171	1143	1116	1091	1067	1043	1021	1000	980	960	923	889	857	1200
1220	1190	1163	1136	1111	1087	1064	1042	1020	1000	962	926	893	1250
1268	1238	1209	1182	1156	1130	1106	1083	1061	1040	1000	963	929	1300
1317	1286	1256	1227	1200	1174	1149	1125	1102	1080	1038	1000	964	1350

Table PER-33. EQUIVALENT STILL AIR DISTANCE—400 kt TAS AND SECTOR DISTANCE 1,400–3,000 nm (SHEET 1 OF 2)

SECT DIST nm	HEADWIND kt ←								→				
	160	140	120	100	90	80	70	60	50	40	30	20	10
1400	2333	2154	2000	1867	1806	1750	1697	1647	1600	1556	1514	1474	1436
1450	2417	2231	2071	1933	1871	1813	1758	1706	1657	1611	1568	1526	1487
1500	2500	2308	2143	2000	1935	1875	1818	1765	1714	1667	1622	1579	1538
1550	2583	2385	2214	2067	2000	1938	1879	1824	1771	1722	1676	1632	1590
1600	2667	2462	2286	2133	2065	2000	1939	1882	1829	1778	1730	1684	1641
1650	2750	2538	2357	2200	2129	2063	2000	1941	1886	1833	1784	1737	1692
1700	2833	2615	2429	2267	2194	2125	2061	2000	1943	1889	1838	1789	1744
1750	2917	2692	2500	2333	2258	2188	2121	2059	2000	1944	1892	1842	1795
1800	3000	2769	2571	2400	2323	2250	2182	2118	2057	2000	1946	1895	1846
1850	3083	2846	2643	2467	2387	2313	2242	2176	2114	2056	2000	1947	1897
1900	3167	2923	2714	2533	2452	2375	2303	2235	2171	2111	2054	2000	1949
1950	3250	3000	2786	2600	2516	2438	2364	2294	2229	2167	2108	2053	2000
2000	3333	3077	2857	2667	2581	2500	2424	2353	2286	2222	2162	2105	2051
2050	3417	3154	2929	2733	2645	2563	2485	2412	2343	2278	2216	2158	2103
2100	3500	3231	3000	2800	2710	2625	2545	2471	2400	2333	2270	2211	2154
2150	3583	3308	3071	2867	2774	2688	2606	2529	2457	2389	2324	2263	2205
2200	3667	3385	3143	2933	2839	2750	2667	2588	2514	2444	2378	2316	2256
2250	3750	3462	3214	3000	2903	2813	2727	2647	2571	2500	2432	2368	2308
2300	3833	3538	3286	3067	2968	2875	2788	2706	2629	2556	2486	2421	2359
2350	3917	3615	3357	3133	3032	2938	2848	2765	2686	2611	2541	2474	2410
2400	4000	3692	3429	3200	3097	3000	2909	2824	2743	2667	2595	2526	2462
2450	4083	3769	3500	3267	3161	3063	2970	2882	2800	2722	2649	2579	2513
2500	4167	3846	3571	3333	3226	3125	3030	2941	2857	2778	2703	2632	2564
2550	4250	3923	3643	3400	3290	3188	3091	3000	2914	2833	2757	2684	2615
2600	4333	4000	3714	3467	3355	3250	3152	3059	2971	2889	2811	2737	2667
2650	4417	4077	3786	3533	3419	3313	3212	3118	3029	2944	2865	2789	2718
2700	4500	4154	3857	3600	3484	3375	3273	3176	3086	3000	2919	2842	2769
2750	4583	4231	3929	3667	3548	3438	3333	3235	3143	3056	2973	2895	2821
2800	4667	4308	4000	3733	3613	3500	3394	3294	3200	3111	3027	2947	2872
2850	4750	4385	4071	3800	3677	3563	3455	3353	3257	3167	3081	3000	2923
2900	4833	4462	4143	3867	3742	3625	3515	3412	3314	3222	3135	3053	2974
2950	4917	4538	4214	3933	3806	3688	3576	3471	3371	3278	3189	3105	3026
3000	5000	4615	4286	4000	3871	3750	3636	3529	3429	3333	3243	3158	3077

Table PER-33. EQUIVALENT STILL AIR DISTANCE—400 kt TAS AND SECTOR DISTANCE 1,400–3,000 nm (SHEET 2 OF 2)

TAILWIND kt													SECT DIST
10	20	30	40	50	60	70	80	90	100	120	140	160	nm
1366	1333	1302	1273	1244	1217	1191	1167	1143	1120	1077	1037	1000	1400
1415	1381	1349	1318	1289	1261	1234	1208	1184	1160	1115	1074	1036	1450
1463	1429	1395	1364	1333	1304	1277	1250	1224	1200	1154	1111	1071	1500
1512	1476	1442	1409	1378	1348	1319	1292	1265	1240	1192	1148	1107	1550
1561	1524	1488	1455	1422	1391	1362	1333	1306	1280	1231	1185	1143	1600
1610	1571	1535	1500	1467	1435	1404	1375	1347	1320	1269	1222	1179	1650
1659	1619	1581	1545	1511	1478	1447	1417	1388	1360	1308	1259	1214	1700
1707	1667	1628	1591	1556	1522	1489	1458	1429	1400	1346	1296	1250	1750
1756	1714	1674	1636	1600	1565	1532	1500	1469	1440	1385	1333	1286	1800
1805	1762	1721	1682	1644	1609	1574	1542	1510	1480	1423	1370	1321	1850
1854	1810	1767	1727	1689	1652	1617	1583	1551	1520	1462	1407	1357	1900
1902	1857	1814	1773	1733	1696	1660	1625	1592	1560	1500	1444	1393	1950
1951	1905	1860	1818	1778	1739	1702	1667	1633	1600	1538	1481	1429	2000
2000	1952	1907	1864	1822	1783	1745	1708	1673	1640	1577	1519	1464	2050
2049	2000	1953	1909	1867	1826	1787	1750	1714	1680	1615	1556	1500	2100
2098	2048	2000	1955	1911	1870	1830	1792	1755	1720	1654	1593	1536	2150
2146	2095	2047	2000	1956	1913	1872	1833	1796	1760	1692	1630	1571	2200
2195	2143	2093	2045	2000	1957	1915	1875	1837	1800	1731	1667	1607	2250
2244	2190	2140	2091	2044	2000	1957	1917	1878	1840	1769	1704	1643	2300
2293	2238	2186	2136	2089	2043	2000	1958	1918	1880	1808	1741	1679	2350
2341	2286	2233	2182	2133	2087	2043	2000	1959	1920	1846	1778	1714	2400
2390	2333	2279	2227	2178	2130	2085	2042	2000	1960	1885	1815	1750	2450
2439	2381	2326	2273	2222	2174	2128	2083	2041	2000	1923	1852	1786	2500
2488	2429	2372	2318	2267	2217	2170	2125	2082	2040	1962	1889	1821	2550
2537	2476	2419	2364	2311	2261	2213	2167	2122	2080	2000	1926	1857	2600
2585	2524	2465	2409	2356	2304	2255	2208	2163	2120	2038	1963	1893	2650
2634	2571	2512	2455	2400	2348	2298	2250	2204	2160	2077	2000	1929	2700
2683	2619	2558	2500	2444	2391	2340	2292	2245	2200	2115	2037	1964	2750
2732	2667	2605	2545	2489	2435	2383	2333	2286	2240	2154	2074	2000	2800
2780	2714	2651	2591	2533	2478	2426	2375	2327	2280	2192	2111	2036	2850
2829	2762	2698	2636	2578	2522	2468	2417	2367	2320	2231	2148	2071	2900
2878	2810	2744	2682	2622	2565	2511	2458	2408	2360	2269	2185	2107	2950
2927	2857	2791	2727	2667	2609	2553	2500	2449	2400	2308	2222	2143	3000



Table PER-34. EQUIVALENT STILL AIR DISTANCE—450 kt TAS AND SECTOR DISTANCE 50–1,350 nm (SHEET 1 OF 2)

SECT DIST nm	HEADWIND kt ←								→				
	160	140	120	100	90	80	70	60	50	40	30	20	10
50	78	73	68	64	63	61	59	58	56	55	54	52	51
100	155	145	136	129	125	122	118	115	113	110	107	105	102
150	233	218	205	193	188	182	178	173	169	165	161	157	153
200	310	290	273	257	250	243	237	231	225	220	214	209	205
250	388	363	341	321	313	304	296	288	281	274	268	262	256
300	466	435	409	386	375	365	355	346	338	329	321	314	307
350	543	508	477	450	438	426	414	404	394	384	375	366	358
400	621	581	545	514	500	486	474	462	450	439	429	419	409
450	698	653	614	579	563	547	533	519	506	494	482	471	460
500	776	726	682	643	625	608	592	577	563	549	536	523	511
550	853	798	750	707	688	669	651	635	619	604	589	576	563
600	931	871	818	771	750	730	711	692	675	659	643	628	614
650	1009	944	886	836	813	791	770	750	731	713	696	680	665
700	1086	1016	955	900	875	851	829	808	788	768	750	733	716
750	1164	1089	1023	964	938	912	888	865	844	823	804	785	767
800	1241	1161	1091	1029	1000	973	947	923	900	878	857	837	818
850	1319	1234	1159	1093	1063	1034	1007	981	956	933	911	890	869
900	1397	1306	1227	1157	1125	1095	1066	1038	1013	988	964	942	920
950	1474	1379	1295	1221	1188	1155	1125	1096	1069	1043	1018	994	972
1000	1552	1452	1364	1286	1250	1216	1184	1154	1125	1098	1071	1047	1023
1050	1629	1524	1432	1350	1313	1277	1243	1212	1181	1152	1125	1099	1074
1100	1707	1597	1500	1414	1375	1338	1303	1269	1238	1207	1179	1151	1125
1150	1784	1669	1568	1479	1438	1399	1362	1327	1294	1262	1232	1203	1176
1200	1862	1742	1636	1543	1500	1459	1421	1385	1350	1317	1286	1256	1227
1250	1940	1815	1705	1607	1563	1520	1480	1442	1406	1372	1339	1308	1278
1300	2017	1887	1773	1671	1625	1581	1539	1500	1463	1427	1393	1360	1330
1350	2095	1960	1841	1736	1688	1642	1599	1558	1519	1482	1446	1413	1381

Table PER-34. EQUIVALENT STILL AIR DISTANCE—450 kt TAS AND SECTOR DISTANCE 50–1,350 nm (SHEET 2 OF 2)

TAILWIND kt													SECT DIST
10	20	30	40	50	60	70	80	90	100	120	140	160	nm
49	48	47	46	45	44	43	42	42	41	39	38	37	50
98	96	94	92	90	88	87	85	83	82	79	76	74	100
147	144	141	138	135	132	130	127	125	123	118	114	111	150
196	191	188	184	180	176	173	170	167	164	158	153	148	200
245	239	234	230	225	221	216	212	208	205	197	191	184	250
293	287	281	276	270	265	260	255	250	245	237	229	221	300
342	335	328	321	315	309	303	297	292	286	276	267	258	350
391	383	375	367	360	353	346	340	333	327	316	305	295	400
440	431	422	413	405	397	389	382	375	368	355	343	332	450
489	479	469	459	450	441	433	425	417	409	395	381	369	500
538	527	516	505	495	485	476	467	458	450	434	419	406	550
587	574	563	551	540	529	519	509	500	491	474	458	443	600
636	622	609	597	585	574	563	552	542	532	513	496	480	650
685	670	656	643	630	618	606	594	583	573	553	534	516	700
734	718	703	689	675	662	649	637	625	614	592	572	553	750
783	766	750	735	720	706	692	679	667	655	632	610	590	800
832	814	797	781	765	750	736	722	708	695	671	648	627	850
880	862	844	827	810	794	779	764	750	736	711	686	664	900
929	910	891	872	855	838	822	807	792	777	750	725	701	950
978	957	938	918	900	882	865	849	833	818	789	763	738	1000
1027	1005	984	964	945	926	909	892	875	859	829	801	775	1050
1076	1053	1031	1010	990	971	952	934	917	900	868	839	811	1100
1125	1101	1078	1056	1035	1015	995	976	958	941	908	877	848	1150
1174	1149	1125	1102	1080	1059	1038	1019	1000	982	947	915	885	1200
1223	1197	1172	1148	1125	1103	1082	1061	1042	1023	987	953	922	1250
1272	1245	1219	1194	1170	1147	1125	1104	1083	1064	1026	992	959	1300
1321	1293	1266	1240	1215	1191	1168	1146	1125	1105	1066	1030	996	1350

Table PER-35. EQUIVALENT STILL AIR DISTANCE—450 kt TAS AND SECTOR DISTANCE 1,400–3,000 nm (SHEET 1 OF 2)

SECT DIST nm	HEADWIND kt ←								→				
	160	140	120	100	90	80	70	60	50	40	30	20	10
1400	2172	2032	1909	1800	1750	1703	1658	1615	1575	1537	1500	1465	1432
1450	2250	2105	1977	1864	1813	1764	1717	1673	1631	1591	1554	1517	1483
1500	2328	2177	2045	1929	1875	1824	1776	1731	1688	1646	1607	1570	1534
1550	2405	2250	2114	1993	1938	1885	1836	1788	1744	1701	1661	1622	1585
1600	2483	2323	2182	2057	2000	1946	1895	1846	1800	1756	1714	1674	1636
1650	2560	2395	2250	2121	2063	2007	1954	1904	1856	1811	1768	1727	1688
1700	2638	2468	2318	2186	2125	2068	2013	1962	1913	1866	1821	1779	1739
1750	2716	2540	2386	2250	2188	2128	2072	2019	1969	1921	1875	1831	1790
1800	2793	2613	2455	2314	2250	2189	2132	2077	2025	1976	1929	1884	1841
1850	2871	2685	2523	2379	2313	2250	2191	2135	2081	2030	1982	1936	1892
1900	2948	2758	2591	2443	2375	2311	2250	2192	2138	2085	2036	1988	1943
1950	3026	2831	2659	2507	2438	2372	2309	2250	2194	2140	2089	2041	1994
2000	3103	2903	2727	2571	2500	2432	2368	2308	2250	2195	2143	2093	2045
2050	3181	2976	2795	2636	2563	2493	2428	2365	2306	2250	2196	2145	2097
2100	3259	3048	2864	2700	2625	2554	2487	2423	2363	2305	2250	2198	2148
2150	3336	3121	2932	2764	2688	2615	2546	2481	2419	2360	2304	2250	2199
2200	3414	3194	3000	2829	2750	2676	2605	2538	2475	2415	2357	2302	2250
2250	3491	3266	3068	2893	2813	2736	2664	2596	2531	2470	2411	2355	2301
2300	3569	3339	3136	2957	2875	2797	2724	2654	2588	2524	2464	2407	2352
2350	3647	3411	3205	3021	2938	2858	2783	2712	2644	2579	2518	2459	2403
2400	3724	3484	3273	3086	3000	2919	2842	2769	2700	2634	2571	2512	2455
2450	3802	3556	3341	3150	3063	2980	2901	2827	2756	2689	2625	2564	2506
2500	3879	3629	3409	3214	3125	3041	2961	2885	2813	2744	2679	2616	2557
2550	3957	3702	3477	3279	3188	3101	3020	2942	2869	2799	2732	2669	2608
2600	4034	3774	3545	3343	3250	3162	3079	3000	2925	2854	2786	2721	2659
2650	4112	3847	3614	3407	3313	3223	3138	3058	2981	2909	2839	2773	2710
2700	4190	3919	3682	3471	3375	3284	3197	3115	3038	2963	2893	2826	2761
2750	4267	3992	3750	3536	3438	3345	3257	3173	3094	3018	2946	2878	2813
2800	4345	4065	3818	3600	3500	3405	3316	3231	3150	3073	3000	2930	2864
2850	4422	4137	3886	3664	3563	3466	3375	3288	3206	3128	3054	2983	2915
2900	4500	4210	3955	3729	3625	3527	3434	3346	3263	3183	3107	3035	2966
2950	4578	4282	4023	3793	3688	3588	3493	3404	3319	3238	3161	3087	3017
3000	4655	4355	4091	3857	3750	3649	3553	3462	3375	3293	3214	3140	3068



Table PER-35. EQUIVALENT STILL AIR DISTANCE—450 kt TAS AND SECTOR DISTANCE 1,400–3,000 nm (SHEET 2 OF 2)

TAILWIND kt													SECT DIST
10	20	30	40	50	60	70	80	90	100	120	140	160	nm
1370	1340	1313	1286	1260	1235	1212	1189	1167	1145	1105	1068	1033	1400
1418	1388	1359	1332	1305	1279	1255	1231	1208	1186	1145	1106	1070	1450
1467	1436	1406	1378	1350	1324	1298	1274	1250	1227	1184	1144	1107	1500
1516	1484	1453	1423	1395	1368	1341	1316	1292	1268	1224	1182	1143	1550
1565	1532	1500	1469	1440	1412	1385	1358	1333	1309	1263	1220	1180	1600
1614	1580	1547	1515	1485	1456	1428	1401	1375	1350	1303	1258	1217	1650
1663	1628	1594	1561	1530	1500	1471	1443	1417	1391	1342	1297	1254	1700
1712	1676	1641	1607	1575	1544	1514	1486	1458	1432	1382	1335	1291	1750
1761	1723	1688	1653	1620	1588	1558	1528	1500	1473	1421	1373	1328	1800
1810	1771	1734	1699	1665	1632	1601	1571	1542	1514	1461	1411	1365	1850
1859	1819	1781	1745	1710	1676	1644	1613	1583	1555	1500	1449	1402	1900
1908	1867	1828	1791	1755	1721	1688	1656	1625	1595	1539	1487	1439	1950
1957	1915	1875	1837	1800	1765	1731	1698	1667	1636	1579	1525	1475	2000
2005	1963	1922	1883	1845	1809	1774	1741	1708	1677	1618	1564	1512	2050
2054	2011	1969	1929	1890	1853	1817	1783	1750	1718	1658	1602	1549	2100
2103	2059	2016	1974	1935	1897	1861	1825	1792	1759	1697	1640	1586	2150
2152	2106	2063	2020	1980	1941	1904	1868	1833	1800	1737	1678	1623	2200
2201	2154	2109	2066	2025	1985	1947	1910	1875	1841	1776	1716	1660	2250
2250	2202	2156	2112	2070	2029	1990	1953	1917	1882	1816	1754	1697	2300
2299	2250	2203	2158	2115	2074	2034	1995	1958	1923	1855	1792	1734	2350
2348	2298	2250	2204	2160	2118	2077	2038	2000	1964	1895	1831	1770	2400
2397	2346	2297	2250	2205	2162	2120	2080	2042	2005	1934	1869	1807	2450
2446	2394	2344	2296	2250	2206	2163	2123	2083	2045	1974	1907	1844	2500
2495	2441	2391	2342	2295	2250	2207	2165	2125	2086	2013	1945	1881	2550
2543	2489	2438	2388	2340	2294	2250	2208	2167	2127	2053	1983	1918	2600
2592	2537	2484	2434	2385	2338	2293	2250	2208	2168	2092	2021	1955	2650
2641	2585	2531	2480	2430	2382	2337	2292	2250	2209	2132	2059	1992	2700
2690	2633	2578	2526	2475	2426	2380	2335	2292	2250	2171	2097	2029	2750
2739	2681	2625	2571	2520	2471	2423	2377	2333	2291	2211	2136	2066	2800
2788	2729	2672	2617	2565	2515	2466	2420	2375	2332	2250	2174	2102	2850
2837	2777	2719	2663	2610	2559	2510	2462	2417	2373	2289	2212	2139	2900
2886	2824	2766	2709	2655	2603	2553	2505	2458	2414	2329	2250	2176	2950
2935	2872	2813	2755	2700	2647	2596	2547	2500	2455	2368	2288	2213	3000



Table PER-36. SECTOR TIME AND FUEL—HIGH SPEED PROCEDURE, ISA HIGH ALTITUDE AND ARRIVAL WEIGHT 17,000 LB (SHEET 1 OF 2)

ALT	29000ft		31000ft		33000ft		35000ft	
	SECTOR		SECTOR		SECTOR		SECTOR	
AIR DIST nm	TIME min	FUEL lb	TIME min	FUEL lb	TIME min	FUEL lb	TIME min	FUEL lb
100	20	562	20	555				
200	33	1074	34	1040	34	1008	34	978
300	46	1586	47	1526	47	1464	47	1410
400	59	2098	60	2011	60	1921	61	1843
500	72	2610	73	2496	73	2378	74	2275
600	85	3122	86	2982	87	2835	87	2707
700	98	3634	99	3467	100	3292	100	3139
800	111	4149	112	3953	113	3749	114	3571
900	124	4670	125	4447	126	4210	127	4003
1000	137	5192	138	4943	139	4680	140	4446
1100	150	5714	151	5438	153	5150	154	4891
1200	163	6236	165	5934	166	5620	167	5336
1300	176	6758	178	6430	179	6090	181	5781
1400	189	7279	191	6925	192	6560	194	6226
1500	202	7804	204	7421	206	7030	207	6671
1600	216	8329	217	7920	219	7500	221	7116
1700	229	8855	230	8419	232	7973	234	7561
1800	242	9381	244	8918	246	8447	248	8009
1900	255	9906	257	9417	259	8920	261	8458
2000			270	9917	272	9394	275	8906
2100					286	9868	288	9354
2200							302	9803
2300								
2400								
2500								
2600								
2700								

Table PER-36. SECTOR TIME AND FUEL—HIGH SPEED PROCEDURE, ISA HIGH ALTITUDE AND ARRIVAL WEIGHT 17,000 LB (SHEET 2 OF 2)

37000ft		*39000ft*		*41000ft*		*43000ft*		*ALT*
SECTOR		*SECTOR*		*SECTOR*		*SECTOR*		
TIME min	FUEL lb	TIME min	FUEL lb	TIME min	FUEL lb	TIME min	FUEL lb	*AIR DIST nm*
								100
34	953	34	910	35	882			*200*
48	1365	48	1288	48	1224	49	1176	*300*
61	1777	61	1666	62	1567	63	1487	*400*
74	2189	75	2044	76	1909	76	1799	*500*
88	2601	89	2422	89	2251	90	2110	*600*
101	3014	102	2800	103	2593	104	2422	*700*
115	3426	116	3178	116	2935	118	2734	*800*
128	3838	129	3557	130	3277	132	3050	*900*
141	4252	143	3935	144	3621	146	3366	*1000*
155	4669	156	4314	158	3968	160	3682	*1100*
168	5086	170	4696	171	4315	174	3998	*1200*
182	5503	184	5078	185	4662	188	4313	*1300*
196	5920	197	5460	199	5009	203	4631	*1400*
209	6337	211	5842	213	5356	217	4954	*1500*
223	6754	225	6223	227	5703	232	5276	*1600*
236	7171	238	6605	241	6050	246	5599	*1700*
250	7589	252	6987	255	6403	260	5921	*1800*
263	8011	266	7369	269	6759	275	6244	*1900*
277	8433	280	7755	284	7116			*2000*
291	8855	294	8146	298	7472			*2100*
305	9278	308	8537	312	7828			*2200*
318	9700	322	8928	327	8184			*2300*
		336	9319	341	8540			*2400*
		351	9710					*2500*
								2600
								2700

Table PER-37. SECTOR TIME AND FUEL—HIGH SPEED PROCEDURE, ISA HIGH ALTITUDE AND ARRIVAL WEIGHT 20,000 LB (SHEET 1 OF 2)

ALT	29000ft		31000ft		33000ft		35000ft	
	SECTOR		SECTOR		SECTOR		SECTOR	
AIR DIST nm	TIME min	FUEL lb	TIME min	FUEL lb	TIME min	FUEL lb	TIME min	FUEL lb
100	21	586	21	581				
200	34	1106	35	1075	35	1045	35	1020
300	47	1626	48	1569	48	1514	48	1464
400	60	2146	61	2063	61	1983	62	1908
500	73	2666	74	2557	74	2452	75	2352
600	86	3187	87	3051	88	2921	88	2796
700	99	3711	100	3548	101	3391	102	3241
800	112	4235	113	4046	114	3863	115	3687
900	125	4760	127	4544	128	4335	129	4133
1000	139	5284	140	5042	141	4807	142	4580
1100	152	5809	153	5540	154	5278	156	5026
1200	165	6334	166	6040	168	5751	169	5473
1300	178	6860	179	6540	181	6224	183	5921
1400	191	7385	193	7040	194	6698	196	6370
1500	204	7911	206	7540	208	7171	210	6819
1600	217	8436	219	8027	221	7645	223	7268
1700	230	8962	233	8507	235	8117	237	7717
1800	244	9487	246	8983	248	8588	250	8166
1900	257	10012	259	9463	261	9059	264	8615
2000			272	9951	275	9529	278	9064
2100					288	9999	291	9513
2200							305	9962
2300								
2400								
2500								
2600								
2700								

Table PER-37. SECTOR TIME AND FUEL—HIGH SPEED PROCEDURE, ISA HIGH ALTITUDE AND ARRIVAL WEIGHT 20,000 LB (SHEET 2 OF 2)

37000ft		*39000ft*		*41000ft*		*43000ft*		*ALT*
SECTOR		*SECTOR*		*SECTOR*		*SECTOR*		
TIME min	FUEL lb	TIME min	FUEL lb	TIME min	FUEL lb	TIME min	FUEL lb	*AIR DIST nm*
								100
35	997	36	961	36	933			*200*
49	1413	49	1342	50	1290	50	1261	*300*
62	1829	63	1722	64	1637	64	1579	*400*
76	2245	76	2103	77	1984	79	1897	*500*
89	2661	90	2483	91	2331	93	2220	*600*
103	3076	104	2864	105	2679	108	2542	*700*
116	3495	117	3244	119	3031	122	2866	*800*
130	3914	131	3630	133	3382	137	3191	*900*
144	4334	145	4015	147	3734	151	3500	*1000*
157	4753	159	4400	162	4086	164	3790	*1100*
171	5173	173	4786	176	4441	179	4117	*1200*
184	5592	187	5171	190	4799	194	4452	*1300*
198	6015	201	5557	205	5158	210	4789	*1400*
212	6437	215	5948	219	5517	224	5113	*1500*
226	6860	229	6341	234	5875	239	5435	*1600*
240	7282	243	6734	248	6198	253	5711	*1700*
253	7704	258	7127	262	6503	267	5911	*1800*
267	8127	272	7520	277	6814	282	6067	*1900*
281	8549	286	7914	291	7156			*2000*
295	8971	300	8307	306	7532			*2100*
309	9394	315	8700	321	7926			*2200*
322	9816	329	9093	337	8327			*2300*
		343	9486	352	8715			*2400*
		357	9879					*2500*
								2600
								2700

Table PER-38. SECTOR TIME AND FUEL—HIGH SPEED PROCEDURE, ISA HIGH ALTITUDE AND ARRIVAL WEIGHT 23,000 LB (SHEET 1 OF 2)

ALT	29000ft		31000ft		33000ft		35000ft	
	SECTOR		SECTOR		SECTOR		SECTOR	
AIR DIST nm	TIME min	FUEL lb	TIME min	FUEL lb	TIME min	FUEL lb	TIME min	FUEL lb
100								
200	35	1136	36	1107	36	1083	36	1060
300	48	1660	49	1605	49	1555	49	1507
400	61	2184	62	2103	62	2028	63	1953
500	74	2709	75	2602	76	2500	76	2401
600	88	3233	88	3102	89	2973	90	2849
700	101	3758	102	3601	103	3445	103	3297
800	114	4284	115	4101	116	3919	117	3745
900	127	4811	128	4600	129	4393	131	4195
1000	140	5337	141	5094	143	4867	144	4645
1100	153	5863	155	5584	156	5341	158	5094
1200	166	6389	168	6074	170	5815	171	5544
1300	180	6916	181	6569	183	6290	185	5994
1400	193	7442	195	7068	196	6764	199	6443
1500	206	7968	208	7570	210	7238	212	6893
1600					223	7712	226	7343
1700							239	7792
1800								
1900								
2000								
2100								

Table PER-38. SECTOR TIME AND FUEL—HIGH SPEED PROCEDURE, ISA HIGH ALTITUDE AND ARRIVAL WEIGHT 23,000 LB (SHEET 2 OF 2)

37000ft		*39000ft*		*41000ft*		*43000ft*		*ALT*
SECTOR		*SECTOR*		*SECTOR*		*SECTOR*		
TIME min	FUEL lb	TIME min	FUEL lb	TIME min	FUEL lb	TIME min	FUEL lb	*AIR DIST nm*
								100
36	1041	37	1022					*200*
50	1461	50	1405	51	1372	52	1349	*300*
64	1880	64	1792	65	1728	66	1677	*400*
77	2300	78	2178	80	2084	81	2005	*500*
91	2721	92	2566	94	2442	96	2335	*600*
105	3143	106	2955	109	2803	111	2669	*700*
118	3565	120	3345	123	3140	126	2976	*800*
132	3988	135	3735	137	3458	140	3169	*900*
146	4412	149	4130	152	3825			*1000*
160	4835	163	4526	167	4204			*1100*
174	5258	178	4921	183	4580			*1200*
188	5681	192	5316	198	4946			*1300*
201	6105	206	5712	213	5305			*1400*
215	6528	221	6107	227	5659			*1500*
229	6951	235	6502	242	6013			*1600*
243	7375	249	6898					*1700*
257	7798	264	7293					*1800*
		278	7688					*1900*
		292	8084					*2000*
								2100

Table PER-39. SECTOR TIME AND FUEL—LONG RANGE PROCEDURE, ISA HIGH ALTITUDE AND ARRIVAL WEIGHT 17,000 LB (SHEET 1 OF 2)

ALT	29,000 FT		31,000 FT		33,000 FT		35,000 FT	
	SECTOR		SECTOR		SECTOR		SECTOR	
AIR DIST	TIME	FUEL	TIME	FUEL	TIME	FUEL	TIME	FUEL
nm	min	lb	min	lb	min	lb	min	lb
100	21	541	21	547				
200	38	887	37	880	36	877	36	873
300	55	1234	53	1212	52	1198	51	1185
400	72	1580	70	1544	68	1518	67	1497
500	89	1926	86	1877	84	1839	82	1808
600	106	2273	103	2209	100	2160	97	2120
700	123	2619	119	2542	116	2481	113	2432
800	140	2965	136	2874	132	2801	128	2743
900	157	3312	152	3206	148	3122	143	3055
1000	174	3658	169	3539	164	3443	159	3367
1100	191	4005	185	3871	180	3764	174	3679
1200	208	4367	202	4212	196	4086	189	3990
1300	225	4729	218	4560	211	4422	205	4315
1400	242	5092	234	4909	227	4758	220	4645
1500	259	5454	251	5257	243	5094	236	4974
1600	276	5817	267	5605	259	5430	251	5304
1700	293	6179	284	5953	275	5766	266	5633
1800	310	6543	300	6302	291	6102	282	5963
1900	327	6904	317	6550	307	6438	297	6292
2000	344	7267	333	6998	323	6774	312	6621
2100	361	7637	350	7347	339	7110	328	6951
2200	378	8020	366	7706	355	7446	343	7280
2300	395	8404	383	8075	371	7800	359	7616
2400	412	8787	399	8444	386	8159	374	7971
2500	429	9171	415	8812	402	8518	389	8326
2600	446	9554	432	9181	418	8877	405	8681
2700	463	9938	448	9550	434	9236	420	9036
2800			465	9919	450	9596	435	9391
2900					466	9955	451	9746
3000								

Table PER-39. SECTOR TIME AND FUEL—LONG RANGE PROCEDURE, ISA HIGH ALTITUDE AND ARRIVAL WEIGHT 17,000 LB (SHEET 2 OF 2)

ALT	37,000 FT		39,000 FT		41,000 FT		43,000 FT	
	SECTOR		SECTOR		SECTOR		SECTOR	
AIR DIST	TIME	FUEL	TIME	FUEL	TIME	FUEL	TIME	FUEL
nm	min	lb	min	lb	min	lb	min	lb
100								
200	36	866	35	864	35	864		
300	51	1163	50	1154	50	1140	50	1132
400	67	1461	65	1443	65	1416	65	1400
500	82	1758	80	1732	80	1691	80	1668
600	97	2056	95	2022	95	1967	95	1936
700	113	2353	110	2311	110	2243	110	2204
800	128	2651	125	2600	125	2518	125	2472
900	144	2948	140	2890	140	2794	140	2743
1000	159	3246	155	3179	155	3070	155	3030
1100	175	3543	170	3468	180	3345	170	3317
1200	190	3840	185	3758	185	3633	185	3604
1300	205	4141	200	4047	200	3933	200	3891
1400	221	4459	215	4352	215	4233	215	4179
1500	236	4778	230	4664	230	4533	229	4466
1600	252	5096	245	4976	245	4833	244	4771
1700	267	5414	260	5289	260	5133	259	5082
1800	283	5732	275	5601	275	5433	274	5393
1900	298	6051	290	5913	290	5732	289	5704
2000	314	6369	305	6225	305	6032	304	6015
2100	329	6687	320	6538	320	6350	319	6326
2200	344	7006	335	6850	335	6685		
2300	360	7324	350	7162	350	7020		
2400	375	7652	365	7474	364	7355		
2500	391	8002	380	7816	379	7690		
2600	406	8353	395	8170	394	8025		
2700	422	8704	410	8524	409	8359		
2800	437	9054	425	8878	424	8694		
2900	452	9405	440	9232				
3000	468	9755	455	9587				

Table PER-40. SECTOR TIME AND FUEL—LONG RANGE PROCEDURE, ISA HIGH ALTITUDE AND ARRIVAL WEIGHT 20,000 LB (SHEET 1 OF 2)

ALT	29,000 FT		31,000 FT		33,000 FT		35,000 FT	
	SECTOR		SECTOR		SECTOR		SECTOR	
AIR DIST	TIME	FUEL	TIME	FUEL	TIME	FUEL	TIME	FUEL
nm	min	lb	min	lb	min	lb	min	lb
100	21	588	21	597				
200	38	946	38	942	37	940	36	941
300	55	1305	54	1286	53	1272	52	1266
400	72	1663	70	1630	69	1604	67	1591
500	89	2022	87	1975	85	1936	82	1916
600	106	2380	103	2319	101	2269	98	2241
700	123	2738	120	2663	116	2601	113	2566
800	140	3098	136	3008	132	2933	129	2891
900	157	3469	153	3361	148	3271	144	3219
1000	174	3840	169	3717	164	3616	159	3559
1100	191	4211	186	4074	180	3961	175	3898
1200	208	4581	202	4430	196	4306	190	4238
1300	225	4952	219	4789	212	4651	205	4577
1400	242	5323	235	5142	228	4996	221	4917
1500	259	5701	251	5499	244	5341	236	5256
1600	276	6087	268	5869	260	5692	251	5597
1700	293	6473	284	6241	276	6055	267	5956
1800	310	6860	301	6613	292	6418	282	6316
1900	327	7246	317	6985	307	6781	298	6675
2000	344	7633	334	7357	323	7144	313	7034
2100	361	8019	350	7728	339	7506	328	7393
2200	380	8320	368	8035	355	7869	344	7752
2300	402	8467	387	8314	371	8232	359	8111
2400	428	8583	407	8623	387	8595	374	8471
2500	455	8818	427	8990	403	8958	390	8830
2600	482	9297	445	9400	419	9321	405	9189
2700	502	9941	461	9815	435	9684	421	9548
2800			476	10202	451	10047	436	9907
2900					467	10410	451	10266
3000								

NOTE:
SHADED AREAS ARE TO BE USED FOR INTERPOLATION PURPOSES

Table PER-40. SECTOR TIME AND FUEL—LONG RANGE PROCEDURE, ISA HIGH ALTITUDE AND ARRIVAL WEIGHT 20,000 LB (SHEET 2 OF 2)

ALT	29,000 FT		31,000 FT		33,000 FT		35,000 FT	
	SECTOR		SECTOR		SECTOR		SECTOR	
AIR DIST	TIME	FUEL	TIME	FUEL	TIME	FUEL	TIME	FUEL
nm	min	lb	min	lb	min	lb	min	lb
100								
200	36	942	36	943	35	944		
300	52	1255	51	1248	51	1244	51	1249
400	67	1567	66	1554	66	1543	66	1546
500	83	1879	81	1842	81	1843	81	1843
600	98	2191	96	2165	96	2141	95	2152
700	113	2504	111	2471	111	2440	110	2461
800	129	2816	126	2777	126	2749	125	2776
900	144	3128	141	3082	140	3068	140	3095
1000	160	3456	156	3399	155	3387	156	3413
1100	175	3787	171	3728	170	3707	172	3704
1200	191	4118	186	4058	185	4026	187	4009
1300	206	4450	201	4387	200	4353	202	4333
1400	222	4781	216	4716	215	4695	218	4695
1500	237	5112	231	5046	230	5037	233	5057
1600	252	5443	246	5375	245	5379	248	5419
1700	268	5788	261	5712	260	5721	263	5772
1800	283	6144	276	6074	271	6063	273	6109
1900	299	6499	291	6435	278	6427	263	6447
2000	314	6855	603	6797	292	6799	277	6831
2100	330	7210	321	7158	307	7171	290	7216
2200	345	7566	663	7519	321	7542		
2300	360	7922	351	7881	335	7914		
2400	376	8277	366	8242	350	8286		
2500	391	8633	381	8604	364	8657		
2600	407	8989	396	8965	378	9029		
2700	422	9344	411	9326	392	9401		
2800	438	9700	426	9688	407	9773		
2900	453	10056	441	10049				
3000	468	10411	456	10410				

NOTE:
SHADED AREAS ARE TO BE USED FOR INTERPOLATION PURPOSES

Table PER-41. SECTOR TIME AND FUEL—LONG RANGE PROCEDURE, ISA HIGH ALTITUDE AND ARRIVAL WEIGHT 23,000 LB (SHEET 1 OF 2)

ALT	29,000 FT		31,000 FT		33,000 FT		35,000 FT	
	SECTOR		SECTOR		SECTOR		SECTOR	
AIR DIST	TIME	FUEL	TIME	FUEL	TIME	FUEL	TIME	FUEL
nm	min	lb	min	lb	min	lb	min	lb
100								
200	37	1017	37	1022				
300	52	1350	51	1355	51	1360	52	1365
400	68	1683	66	1687	66	1693	67	1699
500	83	2016	81	2020	81	2034	82	2054
600	99	2352	96	2352	96	2379	97	2418
700	114	2699	111	2703	111	2728	113	2763
800	129	3045	126	3054	125	3081	125	3108
900	145	3392	141	3406	136	3449	130	3507
1,000	160	3743	156	3761	150	3813		
1,100	176	4106	171	4130	165	4191		
1,200	191	4470	186	4498	179	4568		
1,300	207	4833	201	4867	193	4946		
1,400	222	5196	216	5236	207	5323		
1,500	238	5559	231	5605	221	5701		
1,600	253	5923	246	5974	236	6079		
1,700	269	6286	261	6343	250	6456		
1,800	284	6649	276	6711				
1,900	299	7013	291	7080				
2,000	315	7376	306	7449				
2,100	330	7739	321	7818				
2,200	346	8103	336	8187				
2,300	361	8466	351	8556				
2,400								

NOTE:
SHADED AREAS ARE TO BE USED FOR INTERPOLATION PURPOSES

Table PER-41. SECTOR TIME AND FUEL—LONG RANGE PROCEDURE, ISA HIGH ALTITUDE AND ARRIVAL WEIGHT 23,000 LB (SHEET 2 OF 2)

ALT	29,000 FT		31,000 FT		33,000 FT		35,000 FT	
	SECTOR		SECTOR		SECTOR		SECTOR	
AIR DIST	TIME	FUEL	TIME	FUEL	TIME	FUEL	TIME	FUEL
nm	min	lb	min	lb	min	lb	min	lb
100								
200	39	1006	38	1004	37	1008	37	1013
300	56	1377	54	1362	53	1353	52	1354
400	73	1748	71	1719	89	1699	68	1696
500	90	2119	87	2077	85	2044	83	2038
600	107	2499	104	2440	101	2395	98	2383
700	124	2879	120	2806	117	2751	114	2734
800	141	3259	137	3172	133	3107	129	3086
900	158	3641	153	3537	149	3463	145	3437
1000	175	4032	170	3912	165	3826	160	3794
1100	192	4422	186	4289	181	4194	175	4159
1200	209	4813	203	4665	197	4582	191	4523
1300	226	5203	220	5004	212	4930	206	4887
1400	243	5593	238	5337	228	5288	221	5251
1500	260	5984	256	5690	244	5666	237	5616
1600	277	6374	275	6074	260	6084	252	5980
1700	294	6764	292	6463	276	6402	268	6344
1800	311	7155	309	6845	292	6770	283	6708
1900	328	7545	326	7215	308	7139	298	7072
2000	345	7936	342	7580	324	7507	314	7437
2100			358	7347	339	7110	328	6951
2200					356	7875	329	7801
2300								
2400								

NOTE:
SHADED AREAS ARE TO BE USED FOR INTERPOLATION PURPOSES



Table PER-42. DIVERSION TIME AND FUEL—ISA AND ARRIVAL WEIGHT 17,000 LB (SHEET 1 OF 2)

ALT	5000ft		10000ft		15000ft		19000ft	
	DIVERSION		DIVERSION		DIVERSION		DIVERSION	
AIR DIST nm	TIME min	FUEL lb	TIME min	FUEL lb	TIME min	FUEL lb	TIME min	FUEL lb
20	7	185						
40	12	305	11	288				
60	17	424	16	394	15	377	14	376
80	22	543	20	501	19	473	18	463
100	27	662	25	608	23	568	22	549
120	32	781	30	715	28	663	26	636
140	37	900	34	821	32	759	30	723
160	41	1020	39	928	36	854	34	810
180	46	1139	43	1035	40	950	38	897
200	51	1258	48	1142	45	1045	42	984
220	56	1377	53	1248	49	1141	46	1070
240	61	1496	57	1355	53	1236	50	1157
260	66	1615	62	1462	58	1332	54	1244
280	71	1735	66	1569	62	1427	58	1331
300	76	1854	71	1675	66	1522	62	1418
320	81	1973	75	1782	70	1618	66	1505
340	86	2092	80	1889	75	1713	70	1591
360	91	2211	85	1996	79	1809	74	1678
380	96	2330	89	2102	83	1904	78	1765
400	101	2450	94	2209	87	2000	82	1852
420	106	2569	98	2316	92	2095	86	1939
440	111	2688	103	2423	96	2191	90	2026
460	115	2807	108	2529	100	2286	94	2112
480	120	2926	112	2636	104	2381	98	2199
500	125	3045	117	2743	109	2477	102	2286
520	130	3165	121	2850	113	2572	106	2373
540	135	3284	126	2956	117	2668	110	2460
560	140	3403	130	3063	121	2763	114	2547
580	145	3522	135	3170	126	2859	118	2633
600	150	3641	140	3277	130	2954	122	2720



Table PER-42. DIVERSION TIME AND FUEL—ISA AND ARRIVAL WEIGHT 17,000 LB (SHEET 2 OF 2)

21000ft		*23000ft*		*25000ft*		*27000ft*		*ALT*
DIVERSION		*DIVERSION*		*DIVERSION*		*DIVERSION*		
TIME min	FUEL lb	TIME min	FUEL lb	TIME min	FUEL lb	TIME min	FUEL lb	*AIR DIST nm*
								20
								40
14	377							*60*
18	460	18	461	18	462	18	466	*80*
22	543	22	540	21	537	21	539	*100*
26	626	25	620	25	612	25	611	*120*
30	709	29	699	29	688	28	684	*140*
34	792	33	778	32	763	32	756	*160*
38	875	37	857	36	838	35	828	*180*
41	958	40	936	39	914	39	901	*200*
45	1041	44	1015	43	989	42	973	*220*
49	1124	48	1094	47	1065	46	1045	*240*
53	1207	52	1173	50	1140	49	1118	*260*
57	1290	55	1252	54	1215	53	1190	*280*
61	1373	59	1332	58	1291	56	1262	*300*
65	1456	63	1411	61	1366	60	1335	*320*
69	1539	67	1490	65	1441	63	1407	*340*
72	1622	70	1569	69	1517	67	1479	*360*
76	1705	74	1648	72	1592	70	1552	*380*
80	1788	78	1727	76	1667	74	1624	*400*
84	1871	82	1806	79	1743	77	1696	*420*
88	1954	86	1885	83	1818	81	1769	*440*
92	2037	89	1965	87	1893	84	1841	*460*
96	2120	93	2044	90	1969	88	1913	*480*
100	2202	97	2123	94	2044	91	1986	*500*
103	2285	101	2202	98	2120	95	2058	*520*
107	2368	104	2281	101	2195	98	2130	*540*
111	2451	108	2360	105	2270	102	2203	*560*
115	2534	112	2439	108	2346	105	2275	*580*
119	2617	116	2518	112	2421	109	2347	*600*



Table PER-43. DIVERSION TIME AND FUEL—ISA AND ARRIVAL WEIGHT 20,000 LB (SHEET 1 OF 2)

ALT	5000ft		10000ft		15000ft		19000ft	
	DIVERSION		DIVERSION		DIVERSION		DIVERSION	
AIR DIST nm	TIME min	FUEL lb	TIME min	FUEL lb	TIME min	FUEL lb	TIME min	FUEL lb
20	7	198						
40	12	321	11	305				
60	17	443	16	415	15	406	15	407
80	22	566	21	525	20	504	19	496
100	27	688	25	635	24	602	23	586
120	32	811	30	745	28	700	27	675
140	37	933	34	855	32	798	31	765
160	41	1056	39	965	37	897	35	854
180	46	1178	43	1075	41	995	39	943
200	51	1300	48	1185	45	1093	43	1033
220	56	1423	53	1295	49	1191	47	1122
240	61	1545	57	1405	54	1289	51	1212
260	66	1668	62	1515	58	1387	55	1301
280	71	1790	66	1625	62	1486	59	1391
300	76	1913	71	1735	66	1584	63	1480
320	81	2035	76	1845	71	1682	67	1570
340	86	2158	80	1955	75	1780	71	1659
360	91	2280	85	2065	79	1878	75	1748
380	96	2403	89	2175	83	1977	79	1838
400	101	2525	94	2285	88	2075	83	1927
420	106	2648	99	2395	92	2173	87	2017
440	111	2770	103	2505	96	2271	91	2106
460	116	2896	108	2615	100	2369	95	2196
480	120	3022	112	2725	105	2467	99	2285
500	125	3148	117	2835	109	2566	103	2374
520	130	3274	122	2948	113	2664	107	2464
540	135	3400	126	3061	117	2762	111	2553
560	140	3526	131	3174	122	2860	115	2643
580	145	3652	135	3287	126	2960	119	2732
600	150	3778	140	3399	130	3061	123	2822

NOTES: 1. Effects of temperature on time and fuel are negligible
2. Shaded areas are to be used for interpolation purposes

Table PER-43. DIVERSION TIME AND FUEL—ISA AND ARRIVAL WEIGHT 20,000 LB (SHEET 2 OF 2)

21000ft		23000ft		25000ft		27000ft		ALT
DIVERSION		DIVERSION		DIVERSION		DIVERSION		
TIME min	FUEL lb	TIME min	FUEL lb	TIME min	FUEL lb	TIME min	FUEL lb	AIR DIST nm
								20
								40
15	410							60
19	496	18	496	18	498	18	510	80
22	582	22	578	22	579	21	584	100
26	667	26	660	25	656	25	659	120
30	753	29	741	29	734	29	734	140
34	838	33	823	33	812	32	808	160
38	923	37	905	36	890	36	883	180
42	1009	41	986	40	968	39	958	200
46	1094	44	1068	43	1046	43	1032	220
49	1180	48	1150	47	1124	46	1107	240
53	1265	52	1231	51	1202	50	1182	260
57	1350	56	1313	54	1279	53	1256	280
61	1436	59	1395	58	1357	57	1331	300
65	1521	63	1477	62	1435	60	1406	320
69	1607	67	1558	65	1513	64	1480	340
73	1692	71	1640	69	1591	67	1555	360
77	1778	75	1722	73	1669	71	1630	380
80	1863	78	1803	76	1747	74	1704	400
84	1948	82	1885	80	1825	78	1779	420
88	2034	86	1967	83	1902	81	1854	440
92	2119	90	2048	87	1980	85	1928	460
96	2205	93	2130	91	2058	88	2003	480
100	2290	97	2212	94	2136	92	2078	500
104	2375	101	2294	98	2214	95	2153	520
108	2461	105	2375	102	2292	99	2227	540
111	2546	108	2457	105	2370	102	2302	560
115	2632	112	2539	109	2448	106	2377	580
119	2717	116	2620	113	2525	109	2451	600

NOTES: 1. Effects of temperature on time and fuel are negligible
2. Shaded areas are to be used for interpolation purposes



Table PER-44. DIVERSION TIME AND FUEL—ISA AND ARRIVAL WEIGHT 23,000 LB (SHEET 1 OF 2)

ALT	5000ft		10000ft		15000ft		19000ft	
	DIVERSION		DIVERSION		DIVERSION		DIVERSION	
AIR DIST nm	TIME min	FUEL lb	TIME min	FUEL lb	TIME min	FUEL lb	TIME min	FUEL lb
20	7	216						
40	12	342	12	326				
60	17	468	16	440	15	428	15	433
80	22	594	21	553	20	529	19	529
100	27	720	25	666	24	630	23	621
120	32	847	30	779	28	731	27	713
140	37	973	34	892	32	832	31	805
160	42	1099	39	1005	37	933	35	897
180	47	1225	44	1119	41	1034	39	989
200	52	1351	48	1232	45	1135	43	1082
220	57	1477	53	1345	49	1236	47	1174
240	62	1603	57	1458	54	1337	51	1266
260	66	1729	62	1571	58	1438	55	1358
280	71	1856	67	1684	62	1539	59	1450
300	76	1984	71	1798	66	1640	63	1542
320	81	2112	76	1912	71	1741	67	1634
340	86	2240	80	2027	75	1842	71	1726
360	91	2368	85	2142	79	1944	75	1818
380	96	2496	90	2257	83	2047	79	1910
400	101	2624	94	2372	88	2150	83	2003
420	106	2752	99	2488	92	2253	87	2097
440	111	2880	103	2603	96	2356	91	2191
460	116	3009	108	2718	100	2459	95	2285
480	121	3137	113	2833	105	2562	99	2379
500	126	3265	117	2949	109	2665	103	2473
520	131	3393	122	3064	113	2768	107	2568
540	136	3524	126	3179	117	2871	111	2662
560	140	3655	131	3294	122	2975	115	2756
580	145	3786	136	3410	126	3078	119	2850
600	150	3917	140	3527	130	3181	123	2944

NOTES: 1. Effects of temperature on time and fuel are negligible

2. Shaded areas are to be used for interpolation purposes

Table PER-44. DIVERSION TIME AND FUEL—ISA AND ARRIVAL WEIGHT 23,000 LB (SHEET 1 OF 2)

21000ft		*23000ft*		*25000ft*		*27000ft*		*ALT*
DIVERSION		*DIVERSION*		*DIVERSION*		*DIVERSION*		
TIME min	FUEL lb	TIME min	FUEL lb	TIME min	FUEL lb	TIME min	FUEL lb	*AIR DIST nm*
								20
								40
								60
19	531	18	534					*80*
23	619	22	618	22	622	22	629	*100*
26	707	26	702	26	703	25	706	*120*
30	795	30	787	29	783	29	784	*140*
34	883	33	871	33	863	32	861	*160*
38	971	37	955	37	943	36	938	*180*
42	1060	41	1040	40	1024	39	1015	*200*
46	1148	45	1124	44	1104	43	1093	*220*
50	1236	48	1208	47	1184	46	1170	*240*
54	1324	52	1292	51	1264	50	1247	*260*
57	1412	56	1377	55	1345	53	1325	*280*
61	1500	60	1461	58	1425	57	1402	*300*
65	1588	64	1545	62	1505	60	1479	*320*
69	1676	67	1629	66	1585	64	1557	*340*
73	1764	71	1714	69	1666	68	1634	*360*
77	1852	75	1798	73	1746	71	1711	*380*
81	1940	79	1882	76	1826	75	1788	*400*
85	2029	82	1966	80	1906	78	1866	*420*
88	2119	86	2051	84	1987	82	1943	*440*
92	2209	90	2137	87	2067	85	2020	*460*
96	2299	94	2224	91	2149	89	2098	*480*
100	2389	97	2310	95	2232	92	2177	*500*
104	2480	101	2396	98	2314	96	2256	*520*
108	2570	105	2482	102	2396	99	2335	*540*
112	2660	109	2568	105	2478	103	2414	*560*
116	2750	112	2655	109	2561	106	2493	*580*
119	2840	116	2741	113	2643	110	2572	*600*

NOTES: 1. Effects of temperature on time and fuel are negligible
2. Shaded areas are to be used for interpolation purposes



Table PER-45. HOLDING FUEL FLOW—ENGINE ANTI-ICE OFF

ALTITUDE ft		*1500*	*5000*	*10000*	*15000*	*20000*	*25000*	*30000*	*35000*
Weight lb	*KIAS*	*TOTAL FUEL FLOW lb/hr*							
16000	***165***	1038	1010	971	938	899	887	850	849
17000	***170***	1086	1057	1017	981	940	909	891	879
18000	***175***	1135	1105	1060	1023	982	951	934	922
19000	***180***	1185	1154	1107	1066	1025	995	978	967
20000	***185***	1236	1204	1153	1111	1068	1038	1022	1011
21000	***190***	1288	1250	1197	1154	1111	1080	1065	1054
22000	***194***	1339	1297	1243	1197	1156	1125	1109	1098
23000	***198***	1387	1343	1287	1240	1199	1169	1150	1139
24000	***202***	1433	1388	1332	1283	1242	1213	1193	1181
25000	***206***	1481	1434	1378	1328	1286	1258	1236	1222
26000	***210***	1527	1481	1425	1375	1333	1303	1279	1264

NOTE:

Total fuel flow is increased by approximately 50 lb/hr for every 10°C above ISA and decreased by approximately 50 lb/hr for every 10°C below ISA.

Table PER-46. HOLDING FUEL FLOW—ENGINE ANTI-ICE ON

ALTITUDE ft		*1500*	*5000*	*10000*	*15000*	*20000*	*25000*	*30000*	*35000*
Weight lb	*KIAS*	*TOTAL FUEL FLOW lb/hr*							
16000	***165***	1163	1131	1088	1051	1007	971	952	951
17000	***170***	1216	1184	1139	1099	1053	1018	998	984
18000	***175***	1272	1239	1188	1147	1101	1066	1047	1034
19000	***180***	1314	1280	1228	1182	1137	1103	1085	1072
20000	***185***	1392	1356	1298	1251	1203	1169	1151	1138
21000	***190***	1449	1406	1347	1298	1250	1215	1198	1166
22000	***194***	1532	1464	1422	1369	1322	1287	1269	1256
23000	***198***	1587	1536	1472	1419	1372	1337	1316	1303
24000	***202***	1639	1588	1524	1468	1421	1388	1365	1351
25000	***206***	1694	1641	1576	1519	1471	1439	1414	1398
26000	***210***	1747	1694	1630	1573	1525	1491	1463	1446

NOTE:

Total fuel flow is increased by approximately 50 lb/hr for every 10°C above ISA and decreased by approximately 50 lb/hr for every 10°C below ISA.

Table PER-47. NORMAL CLIMB—ISA (SHEET 1 OF 2)

		ALTITUDE (x1000 ft) AT TOP OF CLIMB										
TOW		1	3	5	7	9	11	13	15	17	19	21
19000	FUEL	62	98	132	157	181	204	228	252	276	302	328
	DIST	0	2	3	5	7	8	10	12	15	17	20
	TIME	1	2	2	2	3	3	4	4	4	5	5
20000	FUEL	65	104	140	166	191	216	241	267	293	319	347
	DIST	0	2	4	5	7	9	11	13	16	19	22
	TIME	1	2	2	3	3	3	4	4	5	5	6
21000	FUEL	69	109	147	175	201	228	254	281	309	337	367
	DIST	0	2	4	6	8	10	12	14	17	20	23
	TIME	1	2	2	3	3	4	4	4	5	6	6
22000	FUEL	72	115	155	184	212	240	268	296	326	356	387
	DIST	0	2	4	6	8	10	12	15	18	21	24
	TIME	1	2	2	3	3	4	4	5	5	6	6
23000	FUEL	75	120	162	193	223	252	281	312	342	374	407
	DIST	0	2	4	6	8	11	13	16	19	22	26
	TIME	1	2	3	3	3	4	4	5	6	6	7
24000	FUEL	78	126	170	203	234	264	295	327	360	393	428
	DIST	0	2	5	7	9	11	14	16	20	23	27
	TIME	1	2	3	3	4	4	5	5	6	6	7
25000	FUEL	81	132	178	212	245	277	309	343	377	412	449
	DIST	0	2	5	7	9	12	14	17	21	24	29
	TIME	1	2	3	3	4	4	5	5	6	7	8
26000	FUEL	84	137	186	222	256	290	324	359	395	432	471
	DIST	0	2	5	7	10	12	15	18	22	26	30
	TIME	1	2	3	3	4	4	5	6	6	7	8
27000	FUEL	87	143	194	232	267	303	338	375	413	452	493
	DIST	0	2	5	8	10	13	16	19	23	27	31
	TIME	1	2	3	4	4	5	5	6	7	7	8
28000	FUEL	90	149	202	242	279	316	353	392	431	472	515
	DIST	0	3	6	8	11	14	17	20	24	28	33
	TIME	2	2	3	4	4	5	5	6	7	8	9

Table PER-47. NORMAL CLIMB—ISA (SHEET 2 OF 2)

ALTITUDE (x1000 ft) AT TOP OF CLIMB												
23	25	27	29	31	33	35	37	39	41	43		TOW
355	383	412	444	478	516	549	586	628	675	731	FUEL	
24	27	32	37	43	50	56	64	75	87	103	DIST	19000
6	7	7	8	9	10	11	12	14	16	18	TIME	
376	406	438	471	508	549	585	625	671	725	790	FUEL	
25	29	34	39	45	53	60	69	80	94	113	DIST	20000
6	7	8	9	10	11	12	13	15	17	20	TIME	
397	429	463	500	539	583	622	666	717	778	857	FUEL	
27	31	36	42	48	57	65	74	86	102	125	DIST	21000
7	8	8	9	10	12	13	14	16	18	22	TIME	
419	453	489	528	571	618	660	708	765	835	935	FUEL	
28	33	38	44	51	60	69	79	93	112	140	DIST	22000
7	8	9	10	11	12	14	15	17	20	24	TIME	
442	478	516	558	603	654	699	752	816	899	1031	FUEL	
30	35	40	47	55	64	73	85	100	122	161	DIST	23000
8	8	9	10	12	13	14	16	18	22	27	TIME	
465	503	544	588	636	691	740	797	870	973	1165	FUEL	
32	37	43	49	58	68	78	91	108	135	191	DIST	24000
8	9	10	11	12	14	15	17	20	24	32	TIME	
488	528	571	618	670	729	782	845	930	1060		FUEL	
33	39	45	52	61	72	83	97	117	152		DIST	25000
8	9	10	11	13	14	16	18	21	26		TIME	
511	554	600	650	705	768	826	897	998	1172		FUEL	
35	41	47	55	65	76	88	104	128	174		DIST	26000
9	10	11	12	14	15	17	19	23	30		TIME	
536	581	629	682	740	808	872	952	1075			FUEL	
37	43	50	58	68	81	94	111	141			DIST	27000
9	10	11	13	14	16	18	21	25			TIME	
560	608	659	715	777	850	920	1013	1168			FUEL	
38	45	52	61	72	86	100	120	158			DIST	28000
10	11	12	13	15	17	19	22	28			TIME	

Table PER-48. HIGH SPEED CRUISE—33,000 FT

CRUISE WEIGHT lb	TEMPERATURE RELATIVE TO ISA °C	-15	-10	-5	0	+5	+10	+15	+20
	AMBIENT TEMP °C	-65	-60	-55	-50	-45	-40	-35	-30
	IOAT °C	-47	-42	-36	-31	-25	-20	-15	-11
18000	KTAS	443	448	453	458	462	463	463	461
	TOTAL FUEL FLOW lb/hr	1920	1963	1997	2035	2017	1927	1843	1754
	KIAS	283	283	283	283	282	279	276	272
20000	KTAS	443	448	453	458	460	460	460	457
	TOTAL FUEL FLOW lb/hr	1986	2028	2059	2098	2013	1922	1839	1748
	KIAS	283	283	283	283	280	277	274	270
22000	KTAS	443	448	453	456	457	457	457	452
	TOTAL FUEL FLOW lb/hr	2057	2093	2128	2106	2008	1917	1833	1740
	KIAS	283	283	283	282	279	276	272	266
24000	KTAS	443	448	453	454	455	455	453	446
	TOTAL FUEL FLOW lb/hr	2135	2166	2191	2102	2003	1912	1824	1730
	KIAS	283	283	283	280	277	274	270	263
26000	KTAS	438	444	449	452	452	451	447	439
	TOTAL FUEL FLOW lb/hr	2059	2093	2130	2098	1999	1904	1814	1719
	KIAS	280	280	280	279	276	271	266	258
27000	KTAS	438	444	449	450	451	447	444	435
	TOTAL FUEL FLOW lb/hr	2096	2126	2166	2095	1995	1897	1808	1713
	KIAS	280	280	280	278	274	269	264	255

NOTE:
V_{MO} is limited to the ventral tank full speed at higher weights.

Table PER-49. HIGH SPEED CRUISE—35,000 FT

CRUISE WEIGHT lb	TEMPERATURE RELATIVE TO ISA °C	-15	-10	-5	0	+5	+10	+15	+20
	AMBIENT TEMP °C	-69	-64	-59	-54	-49	-44	-39	-34
	IOAT °C	-51	-46	-40	-35	-30	-25	-20	-15
18000	KTAS	439	444	449	454	457	458	458	456
	TOTAL FUEL FLOW lb/hr	1798	1835	1871	1902	1875	1788	1712	1630
	KIAS	270	270	270	270	269	266	263	259
20000	KTAS	439	444	449	454	455	455	455	451
	TOTAL FUEL FLOW lb/hr	1874	1911	1941	1973	1870	1783	1706	1622
	KIAS	270	270	270	270	267	264	261	256
22000	KTAS	439	444	449	452	452	452	451	445
	TOTAL FUEL FLOW lb/hr	1959	1990	2026	1969	1865	1777	1699	1612
	KIAS	270	270	270	268	265	262	258	252
24000	KTAS	439	444	447	449	449	448	444	437
	TOTAL FUEL FLOW lb/hr	2042	2077	2030	1965	1860	1770	1686	1600
	KIAS	270	270	269	267	264	260	254	247
26000	KTAS	438	442	444	446	445	441	436	427
	TOTAL FUEL FLOW lb/hr	2098	2096	2023	1960	1852	1756	1673	1586
	KIAS	270	269	267	265	261	256	250	241
27000	KTAS	436	440	442	444	442	438	431	418
	TOTAL FUEL FLOW lb/hr	2092	2091	2018	1957	1847	1750	1663	1574
	KIAS	269	268	266	263	259	254	246	236



Table PER-50. HIGH SPEED CRUISE—37,000 FT

CRUISE WEIGHT lb	TEMPERATURE RELATIVE TO ISA °C	-15	-10	-5	0	+5	+10	+15	+20
	AMBIENT TEMP °C	-72	-67	-62	-57	-52	-47	-42	-37
	IOAT °C	-54	-49	-43	-38	-33	-28	-22	-18
18000	KTAS	436	441	447	452	453	454	454	451
	TOTAL FUEL FLOW lb/hr	1717	1751	1782	1817	1732	1646	1576	1499
	KIAS	258	258	258	258	256	253	250	246
20000	KTAS	436	441	447	450	450	451	450	445
	TOTAL FUEL FLOW lb/hr	1802	1830	1867	1829	1726	1640	1569	1489
	KIAS	258	258	258	257	254	251	248	242
22000	KTAS	436	441	445	447	447	447	443	437
	TOTAL FUEL FLOW lb/hr	1882	1916	1877	1824	1721	1632	1556	1478
	KIAS	258	258	257	255	252	249	244	237
24000	KTAS	434	439	441	443	442	439	435	425
	TOTAL FUEL FLOW lb/hr	1912	1928	1869	1818	1713	1618	1542	1462
	KIAS	257	257	255	253	249	244	239	230
26000	KTAS	430	435	437	438	435	428	418	396
	TOTAL FUEL FLOW lb/hr	1897	1914	1856	1809	1699	1598	1517	1427
	KIAS	255	254	252	250	244	238	229	214
27000	KTAS	428	432	434	435	430	422	402	
	TOTAL FUEL FLOW lb/hr	1888	1906	1850	1802	1691	1587	1494	
	KIAS	253	253	251	248	242	234	219	

Table PER-51 HIGH SPEED CRUISE—39,000 FT

CRUISE WEIGHT lb	TEMPERATURE RELATIVE TO ISA °C	-15	-10	-5	0	+5	+10	+15	+20
	AMBIENT TEMP °C	-72	-67	-62	-57	-52	-47	-42	-37
	IOAT °C	-54	-49	-43	-38	-33	-28	-23	-18
18000	KTAS	436	442	447	449	449	450	450	444
	TOTAL FUEL FLOW lb/hr	1658	1684	1711	1653	1561	1486	1423	1349
	KIAS	247	247	246	244	242	239	236	230
20000	KTAS	436	442	444	446	446	445	442	435
	TOTAL FUEL FLOW lb/hr	1733	1767	1703	1649	1556	1477	1410	1339
	KIAS	247	247	245	243	240	237	232	225
22000	KTAS	434	438	440	441	440	437	431	421
	TOTAL FUEL FLOW lb/hr	1743	1756	1694	1643	1547	1462	1395	1322
	KIAS	245	244	242	240	236	232	226	217
24000	KTAS	429	433	435	434	430	423	409	
	TOTAL FUEL FLOW lb/hr	1726	1740	1682	1634	1533	1441	1364	
	KIAS	242	241	239	236	231	224	213	
26000	KTAS	422	426	425	424	415			
	TOTAL FUEL FLOW lb/hr	1704	1719	1659	1620	1514			
	KIAS	238	237	233	230	222			
27000	KTAS	416	420	419	417	401			
	TOTAL FUEL FLOW lb/hr	1685	1701	1648	1612	1496			
	KIAS	234	234	230	226	214			

Table PER-52. HIGH SPEED CRUISE—41,000 FT

	TEMPERATURE RELATIVE TO ISA °C	–15	–10	–5	0	+5	+10	+15	+20
CRUISE WEIGHT	AMBIENT TEMP °C	–72	–67	–62	–57	–52	–47	–42	–37
LB	IOAT° C	–54	–49	–43	–38	–33	–28	–24	–19
18000	KTAS	436	442	443	445	445	444	440	432
	TOTAL FUEL FLOW lb/hr	1579	1609	1541	1483	1405	1335	1273	1207
	KIAS	235	235	233	231	228	225	220	213
20000	KTAS	433	438	439	440	437	435	428	416
	TOTAL FUEL FLOW lb/hr	1586	1598	1532	1476	1393	1321	1258	1191
	KIAS	234	233	231	228	224	220	213	205
22000	KTAS	428	433	433	432	425	416	397	
	TOTAL FUEL FLOW lb/hr	1569	1582	1519	1466	1378	1295	1222	
	KIAS	230	230	227	224	217	210	197	
24000	KTAS	420	424	421	419	407			
	TOTAL FUEL FLOW lb/hr	1544	1557	1496	1452	1356			
	KIAS	226	225	221	216	207			
26000	KTAS								
	TOTAL FUEL FLOW lb/hr								
	KIAS								
27000	KTAS								
	TOTAL FUEL FLOW lb/hr								
	KIAS								

Table PER-53. HIGH SPEED CRUISE—43,000 FT

	TEMPERATURE RELATIVE TO ISA °C	–15	–10	–5	0	+5	+10	+15	+20
CRUISE WEIGHT	AMBIENT TEMP °C	–72	–67	–62	–57	–52	–47	–42	–37
LB	IOAT ° C	–54	–49	–43	–38	–33	–28	–24	–19
18000	KTAS	433	438	438	438	435	431	423	406
	TOTAL FUEL FLOW lb/hr	1452	1463	1388	1323	1254	1191	1132	1067
	KIAS	223	222	220	217	212	208	201	191
20000	KTAS	427	432	431	427	421	407		
	TOTAL FUEL FLOW lb/hr	1436	1448	1374	1311	1237	1162		
	KIAS	219	219	216	211	205	195		
22000	KTAS	417	421	417	413				
	TOTAL FUEL FLOW lb/hr	1409	1421	1351	1296				
	KIAS	214	213	208	203				
24000	KTAS								
	TOTAL FUEL FLOW lb/hr								
	KIAS								
26000	KTAS								
	TOTAL FUEL FLOW lb/hr								
	KIAS								
27000	KTAS								
	TOTAL FUEL FLOW lb/hr								
	KIAS								

Table PER-54. LONG RANGE CRUISE—230 KIAS

		TEMPERATURE RELATIVE TO ISA ° C							
ALTITUDE FEET		–15	–10	–5	0	+5	+10	+15	+20
15000	KTAS	274	277	280	282	285	288	290	293
	TOTAL FUEL FLOW lb/hr	1335	1348	1364	1381	1398	1416	1433	1451
13000	KTAS	266	268	271	274	276	279	281	284
	TOTAL FUEL FLOW lb/hr	1357	1371	1388	1404	1421	1439	1457	1474
11000	KTAS	258	261	263	266	268	271	273	275
	TOTAL FUEL FLOW lb/hr	1377	1392	1409	1425	1442	1467	1479	1497
9000	KTAS	251	253	256	258	260	263	265	267
	TOTAL FUEL FLOW lb/hr	1400	1415	1431	1448	1466	1484	1503	1522
7000	KTAS	243	246	248	250	253	255	257	259
	TOTAL FUEL FLOW lb/hr	1421	1437	1453	1471	1489	1507	1525	1544
5000	KTAS	237	239	241	243	246	248	250	252
	TOTAL FUEL FLOW lb/hr	1442	1457	1474	1492	1510	1528	1546	1564
3000	KTAS	230	232	234	236	238	240	243	245
	TOTAL FUEL FLOW lb/hr	1467	1483	1501	1518	1536	1554	1571	1589
1000	KTAS	224	226	228	230	232	234	236	238
	TOTAL FUEL FLOW lb/hr	1497	1508	1526	1543	1561	1578	1596	1614

NOTE: The above table is calculated a6t 22,000 lb aircraft weight.

CORRECTIONS FOR FUEL FLOW FOR DIFFERENT AIRCRAFT WEIGHTS ARE SHOWN BELOW.

WEIGHT LB	LB/HR	WEIGHT LB	LB/HR
27,000	+100	22,000	0
26,000	+80	20,000	–30
24,000	+40	18,000	–60

Table PER-55. LONG RANGE CRUISE—33,000 FT

CRUISE WEIGHT LB	TEMPERATURE RELATIVE TO ISA °C	–15	–10	–5	0	+5	+10	+15	+20
	AMBIENT TEMP °C	–65	–60	–55	–50	–45	–40	–35	–30
	IOAT ° C	–53	–48	–43	–37	–32	–27	–21	–16
18000	KTAS	365	369	374	378	382	386	390	395
	TOTAL FUEL FLOW lb/hr	1115	1136	1154	1172	1192	1211	1232	1254
	KIAS	230	230	230	230	230	230	230	230
20000	KTAS	365	369	374	378	382	386	390	395
	TOTAL FUEL FLOW lb/hr	1147	1170	1187	1204	1224	1246	1268	1289
	KIAS	230	230	230	230	230	230	230	230
22000	KTAS	365	369	374	378	382	386	390	395
	TOTAL FUEL FLOW lb/hr	1182	1204	1221	1238	1259	1283	1305	1328
	KIAS	230	230	230	230	230	230	230	230
24000	KTAS	365	369	374	378	382	386	390	395
	TOTAL FUEL FLOW lb/hr	1222	1244	1260	1278	1304	1327	1349	1370
	KIAS	230	230	230	230	230	230	230	230
26000	KTAS	365	369	374	378	382	386	390	395
	TOTAL FUEL FLOW lb/hr	1274	1297	1315	1337	1361	11383	1404	1435
	KIAS	230	230	230	230	230	230	230	230
27000	KTAS	365	369	374	378	382	386	390	395
	TOTAL FUEL FLOW lb/hr	1304	1329	1350	1372	1394	1415	1444	1474
	KIAS	230	230	230	230	230	230	230	230

Table PER-56. LONG RANGE CRUISE—35,000 FT

CRUISE WEIGHT LB	TEMPERATURE RELATIVE TO ISA °C	–15	–10	–5	0	+5	+10	+15	+20
	AMBIENT TEMP °C	–69	–64	–59	–54	–49	–44	–39	–34
	IOAT° C	–56	–51	–46	–40	–35	–30	–24	–19
18000	KTAS	378	382	387	391	396	400	405	409
	TOTAL FUEL FLOW lb/hr	1120	1143	1161	1176	1198	1221	1243	1264
	KIAS	230	230	230	230	230	230	230	230
20000	KTAS	378	382	387	391	396	400	405	409
	TOTAL FUEL FLOW lb/hr	1154	1178	1196	1213	1238	1259	1281	1303
	KIAS	230	230	230	230	230	230	230	230
22000	KTAS	378	382	387	391	396	400	405	409
	TOTAL FUEL FLOW lb/hr	1190	1214	1235	1255	1278	1298	1320	1350
	KIAS	230	230	230	230	230	230	230	230
24000	KTAS	378	382	387	391	396	400	405	409
	TOTAL FUEL FLOW lb/hr	1233	1261	1285	1306	1327	1347	1378	1408
	KIAS	230	230	230	230	230	230	230	230
26000	KTAS	378	382	387	391	396	400	405	409
	TOTAL FUEL FLOW lb/hr	1295	1328	1351	1371	1393	1422	1454	1482
	KIAS	230	230	230	230	230	230	230	230
27000	KTAS	378	382	387	391	396	400	405	409
	TOTAL FUEL FLOW lb/hr	1336	1367	1390	1409	1438	1469	1499	1526
	KIAS	230	230	230	230	230	230	230	230

Table PER-57. LONG RANGE CRUISE—37,000 FT

CRUISE WEIGHT LB	TEMPERATURE RELATIVE TO ISA ° C	–15	–10	–5	0	+5	+10	+15	+20
	AMBIENT TEMP °C	–72	–67	–62	–57	–52	–47	–42	–37
	IOAT ° C	–58	–53	–48	–43	–37	–32	–27	–21
18000	KTAS	376	381	385	390	394	399	403	407
	TOTAL FUEL FLOW lb/hr	1056	1076	1096	1113	1135	1156	1175	1195
	KIAS	220	220	220	220	220	220	220	220
20000	KTAS	376	381	385	390	394	399	403	407
	TOTAL FUEL FLOW lb/hr	1091	1111	1132	1154	1175	1194	1213	1240
	KIAS	220	220	220	220	220	220	220	220
22000	KTAS	376	381	385	390	394	399	403	407
	TOTAL FUEL FLOW lb/hr	1132	1154	1182	1203	1222	1240	1269	1296
	KIAS	220	220	220	220	220	220	220	220
24000	KTAS	376	381	385	390	394	399	403	407
	TOTAL FUEL FLOW lb/hr	1192	1224	1249	1268	1288	1318	1346	1371
	KIAS	220	220	220	220	220	220	220	220
26000	KTAS	376	381	385	390	394	399	403	407
	TOTAL FUEL FLOW lb/hr	1279	1307	1330	1354	1384	1414	1443	1426
	KIAS	220	220	220	220	220	220	220	220
27000	KTAS	376	381	385	390	394	399	403	
	TOTAL FUEL FLOW lb/hr	1326	1350	1379	1405	1435	1468	1494	
	KIAS	220	220	220	220	220	220	220	

Table PER-58. LONG RANGE CRUISE—39,000 FT

CRUISE WEIGHT LB	TEMPERATURE RELATIVE TO ISA ° C	–15	–10	–5	0	+5	+10	+15	+20
	AMBIENT TEMP °C	–72	–67	–62	–57	–52	–47	–42	–37
	IOAT ° C	–58	–52	–47	–42	–36	–31	–26	–20
18000	KTAS	387	392	397	402	406	411	415	420
	TOTAL FUEL FLOW lb/hr	1048	1065	1092	1113	1132	1148	1175	1200
	KIAS	217	217	217	217	217	217	217	217
20000	KTAS	387	392	397	402	406	411	415	420
	TOTAL FUEL FLOW lb/hr	1083	1111	1136	1154	1172	1198	1225	1248
	KIAS	217	217	217	217	217	217	217	217
22000	KTAS	387	392	397	402	406	411	415	420
	TOTAL FUEL FLOW lb/hr	1144	1171	1193	1209	1239	1267	1291	1316
	KIAS	217	217	217	217	217	217	217	217
24000	KTAS	387	392	397	402	406	411	415	
	TOTAL FUEL FLOW lb/hr	1225	1250	1278	1306	1332	1361	1364	
	KIAS	217	217	217	217	217	217	217	
26000	KTAS	387	392	397	402	406			
	TOTAL FUEL FLOW lb/hr	1326	1359	1394	1422	1453			
	KIAS	217	217	217	217	217			
27000	KTAS	387	392	397	402	406			
	TOTAL FUEL FLOW lb/hr	1383	1419	1455	1481	1497			
	KIAS	217	217	217	217	217			

Table PER-59. LONG RANGE CRUISE—41,000 FT

CRUISE WEIGHT LB	TEMPERATURE RELATIVE TO ISA ° C	–15	–10	–5	0	+5	+10	+15	+20
	AMBIENT TEMP °C	–72	–67	–62	–57	–52	–47	–42	–37
	IOAT ° C	–58	–52	–47	–42	–36	–31	–26	–20
18000	KTAS	388	392	397	402	406	411	415	420
	TOTAL FUEL FLOW lb/hr	1004	1027	1047	1064	1079	1105	1128	1147
	KIAS	207	207	207	207	207	207	207	207
20000	KTAS	388	392	397	402	406	411	415	416
	TOTAL FUEL FLOW lb/hr	1062	1083	1101	1118	1146	1169	1188	1192
	KIAS	207	207	207	207	207	207	207	205
22000	KTAS	388	392	397	402	406	411	415	
	TOTAL FUEL FLOW lb/hr	1140	1160	1190	1214	1236	1267	1223	
	KIAS	207	207	207	207	207	207	197	
24000	KTAS	388	392	397	402	406			
	TOTAL FUEL FLOW lb/hr	1234	1265	1299	1329	1356			
	KIAS	207	207	207	207	207			
26000	KTAS	388	392	397	402				
	TOTAL FUEL FLOW lb/hr	1344	1374	1400	1427				
	KIAS	207	207	207	207				
27000	KTAS	388	392	397					
	TOTAL FUEL FLOW lb/hr	1398	1425	1454					
	KIAS	207	207	207					

Table PER-60. LONG RANGE CRUISE—43,000 FT

CRUISE WEIGHT LB	TEMPERATURE RELATIVE TO ISA ° C	–15	–10	–5	0	+5	+10	+15	+20
	AMBIENT TEMP °C	–72	–67	–62	–57	–52	–47	–42	–37
	IOAT ° C	–58	–52	–47	–42	–36	–31	–26	–21
18000	KTAS	388	392	397	402	406	411	415	406
	TOTAL FUEL FLOW lb/hr	983	1001	1016	1035	1059	1079	1096	1067
	KIAS	197	197	197	197	197	197	197	191
20000	KTAS	388	392	397	402	406	406		
	TOTAL FUEL FLOW lb/hr	1059	1078	1104	1127	1150	1161		
	KIAS	197	197	197	197	197	195		
22000	KTAS	388	392	397	402				
	TOTAL FUEL FLOW lb/hr	1153	1183	1212	1238				
	KIAS	197	197	197	197				
24000	KTAS	388	392	397					
	TOTAL FUEL FLOW lb/hr	1261	1287	1312					
	KIAS	197	197	197					
26000	KTAS								
	TOTAL FUEL FLOW lb/hr								
	KIAS								
27000	KTAS								
	TOTAL FUEL FLOW lb/hr								
	KIAS								

CRUISE AIR MILES PER POUND OF FUEL

Refer to Figures PER-70 through PER-73 (*CM* 2-4-4 pages 4–7).

NORMAL DESCENT

Refer to Table PER-61 (*CM* 2-5-1 pages 2–3).

SINGLE ENGINE

Refer to Tables PER-62 (*CM* 2-6-1 page 2) through PER-63 (*CM* 2-6-1 page 3) and Figure PER-74 (CM 2-6-1 page 4).

SINGLE ENGINE DRIFTDOWN

Refer to Table PER-64 (*CM* 2-6-2 pages 6–7).

SINGLE ENGINE LONG RANGE CRUISE

Refer to Table PER-47 (*CM* 2-3-1 pages 6–7).

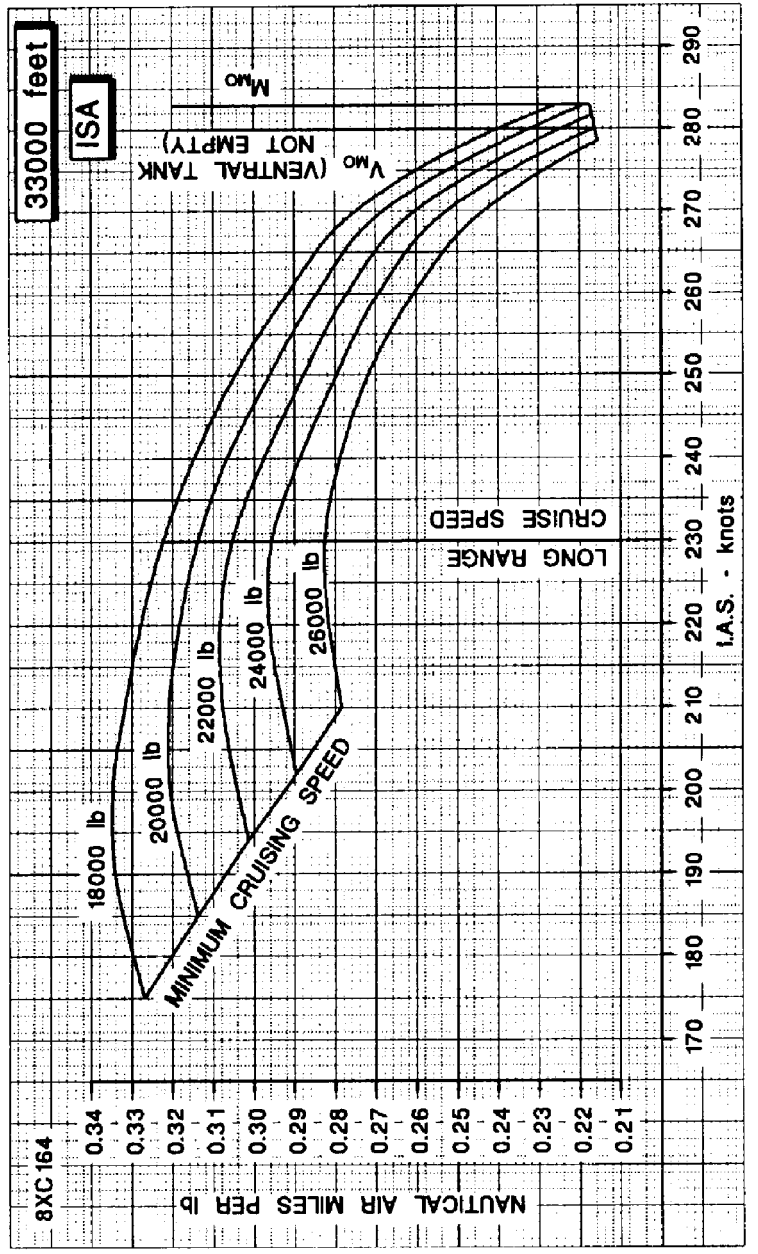


Figure PER-70. Cruise Air Miles Per Pound of Fuel—33,000 feet/ISA

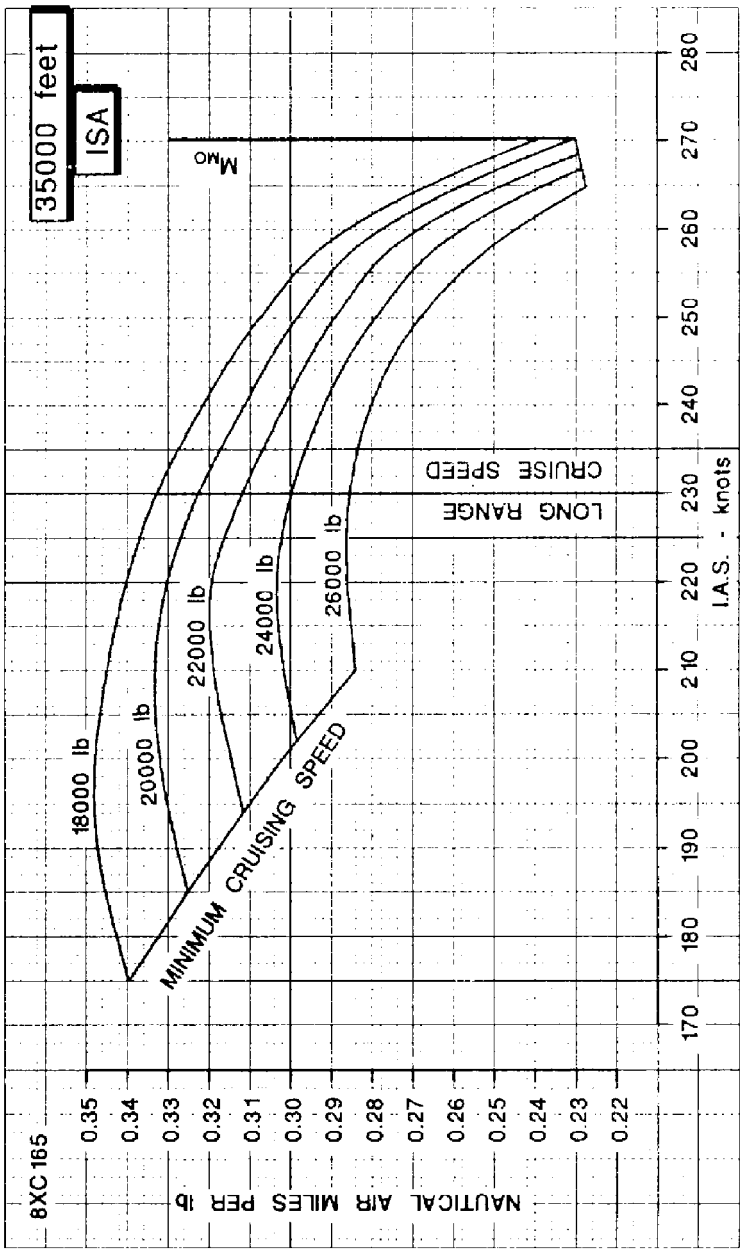


Figure PER-71. Cruise Air Miles Per Pound of Fuel—35,000 feet/ISA

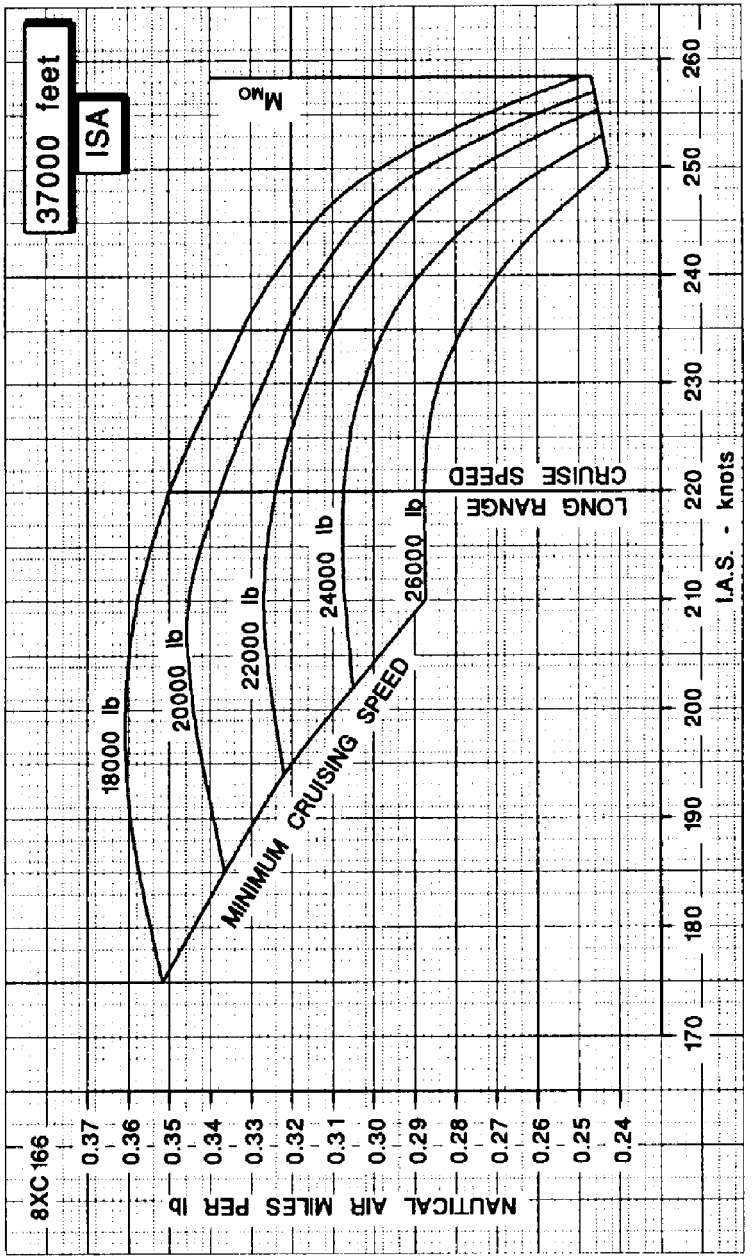


Figure PER-72. Cruise Air Miles Per Pound of Fuel—37,000 feet/ISA

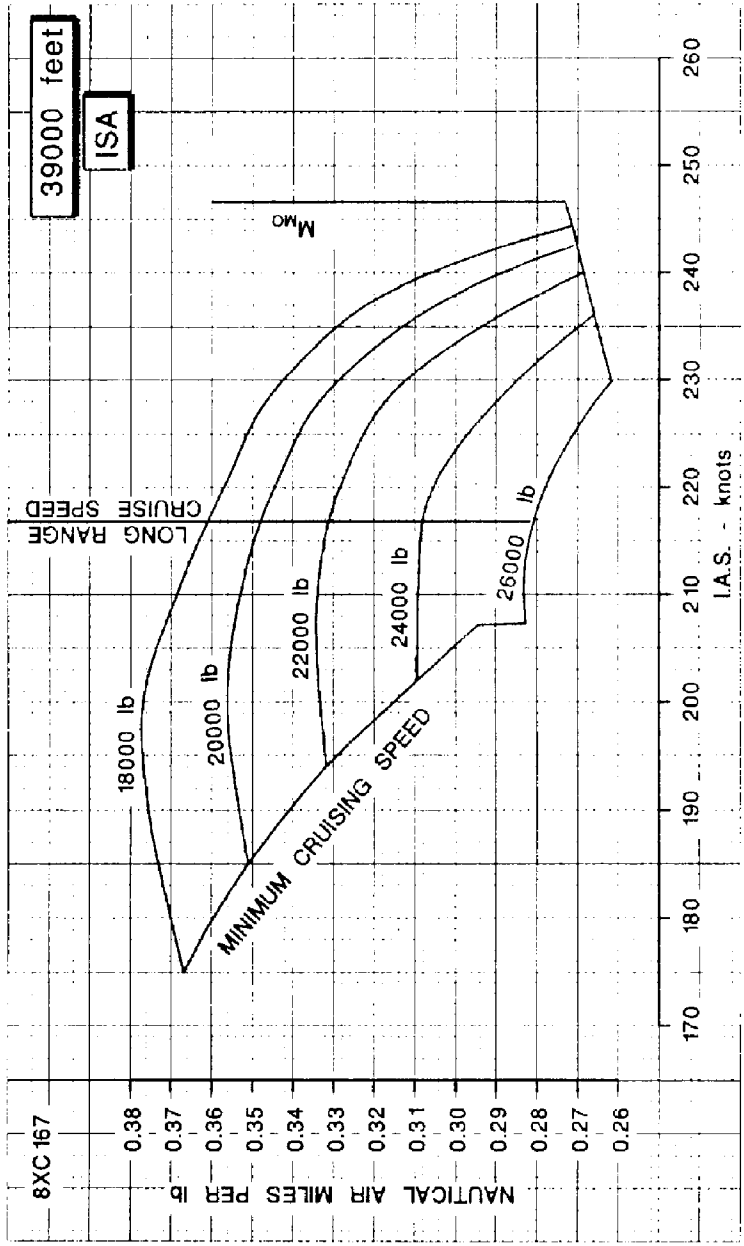


Figure PER-73. Cruise Air Miles Per Pound of Fuel—39,000 feet/ISA

Table PER-61. NORMAL DESCENT—ISA (SHEET 1 OF 2)

Units: ARRIVAL WEIGHT (ARR WT) lb, FUEL lb, DIST nm, TIME min

		ALTITUDE (x1000 ft) AT TOP OF DESCENT										
ARR WT		1.5	3	5	7	9	11	13	15	17	19	21
17000	FUEL	0	19	33	40	46	54	60	64	69	73	77
	DIST	0	6	13	16	20	24	28	31	34	37	41
	TIME	0	2	4	5	5	6	7	8	8	9	9
18000	FUEL	0	19	34	41	48	56	62	66	71	76	80
	DIST	0	6	13	17	21	25	29	32	36	39	42
	TIME	0	2	4	5	6	6	7	8	8	9	9
19000	FUEL	0	19	35	42	49	57	64	68	73	78	83
	DIST	0	6	13	17	21	26	30	33	37	40	44
	TIME	0	2	4	5	6	7	7	8	9	9	10
20000	FUEL	0	19	35	42	50	59	65	70	75	80	85
	DIST	0	6	14	18	22	27	31	34	38	42	45
	TIME	0	2	4	5	6	7	8	8	9	9	10
21000	FUEL	0	19	35	43	51	60	67	72	77	82	87
	DIST	0	6	14	18	22	27	32	35	39	43	47
	TIME	0	2	4	5	6	7	8	8	9	10	10
22000	FUEL	0	19	36	44	52	61	68	73	79	84	89
	DIST	0	6	14	18	22	28	32	36	40	44	48
	TIME	0	2	4	5	6	7	8	9	9	10	11
23000	FUEL	0	19	36	44	52	62	69	75	80	86	91
	DIST	0	6	14	18	23	28	33	37	41	45	49
	TIME	0	2	4	5	6	7	8	9	9	10	11
24000	FUEL	0	19	36	45	53	63	70	76	82	88	93
	DIST	0	6	14	19	23	29	34	38	42	46	50
	TIME	0	2	4	5	6	7	8	9	10	10	11
25000	FUEL	0	19	37	45	54	64	72	78	83	89	95
	DIST	0	6	14	19	24	29	34	39	43	47	52
	TIME	0	2	4	5	6	7	8	9	10	11	11
26000	FUEL	0	19	37	45	54	65	73	79	85	91	97
	DIST	0	6	14	19	24	30	35	39	44	48	53
	TIME	0	2	4	5	6	8	8	9	10	11	11

NOTE: The effect of temperature on descent fuel, distance and time is negligible

Table PER-61. NORMAL DESCENT—ISA (SHEET 2 OF 2)

Units: ARRIVAL WEIGHT (ARR WT) lb, FUEL lb, DIST nm, TIME min

ALTITUDE (x1000 ft) AT TOP OF DESCENT												
23	25	27	29	31	33	35	37	39	41	43		ARR WT
81	85	89	93	97	100	103	107	142	174	204	FUE	
44	47	51	54	57	60	63	67	81	95	110	DIST	17000
10	10	11	11	12	12	12	13	15	17	19	TIME	
84	88	93	97	101	104	107	112	146	178	209	FUE	
46	49	53	57	60	63	66	69	84	98	113	DIST	18000
10	10	11	12	12	12	13	13	15	17	19	TIME	
87	91	96	100	104	108	111	116	150	183	213	FUE	
48	51	55	59	62	65	69	72	87	101	115	DIST	19000
10	11	11	12	12	13	13	14	16	18	20	TIME	
90	94	99	104	108	111	115	119	154	187	219	FUE	
49	53	57	61	65	68	71	75	89	104	118	DIST	20000
11	11	12	12	13	13	14	14	16	18	20	TIME	
92	97	102	107	111	114	118	123	158	191	224	FUE	
51	55	59	63	67	70	73	77	92	106	121	DIST	21000
11	12	12	13	13	14	14	15	17	19	21	TIME	
94	99	104	109	114	117	122	126	162	196	229	FUE	
52	56	61	65	69	72	76	80	94	109	123	DIST	22000
11	12	12	13	14	14	15	15	17	19	21	TIME	
96	102	107	112	116	120	124	129	165	200	235	FUE	
53	58	62	66	71	74	78	82	96	111	125	DIST	23000
11	12	13	13	14	14	15	15	17	19	21	TIME	
98	104	109	114	119	123	127	132	169	205	241	FUE	
55	59	64	68	72	76	80	84	99	113	127	DIST	24000
12	12	13	14	14	15	15	16	18	20	22	TIME	
100	106	111	117	122	126	130	135	172	209	247	FUE	
56	61	65	70	74	78	82	86	101	115	129	DIST	25000
12	13	13	14	15	15	16	16	18	20	22	TIME	
102	108	114	119	124	128	133	138	176	214	253	FUE	
57	62	67	71	76	80	84	88	102	117	131	DIST	26000
12	13	14	14	15	15	16	16	18	20	22	TIME	

NOTE: The effect of temperature on descent fuel, distance and time is negligible

Table PER-62. SUMMARY OF SINGLE ENGINE CEILINGS

				SINGLE ENGINE CEILING ft AT TEMPERATURES, RELATIVE TO ISA °C			
WEIGHT lb	SPEED	KIAS	ENGINE ANTICE	-15	0	+10	+20
26000	E.R.CLIMB 0%	180	OFF	24450	21450	19300	15850
	E.R.CLIMB1.1%	180	OFF	20800	17150	14500	11100
	MIN. CRUISE	210	OFF	25800	22500	20300	16700
	L.R. CRUISE	240	OFF	23100	18800	16000	11800
	L.R. CRUISE	240	ON	20200	14100	12000	7800
24000	E.R.CLIMB 0%	172	OFF	26200	23850	21550	18800
	E.R.CLIMB1.1%	172	OFF	22700	19450	17200	13750
	MIN.CRUISE	202	OFF	27800	25000	22800	19900
	L.R. CRUISE	230	OFF	25500	21400	19200	14800
	L.R. CRUISE	230	ON	22400	16400	14400	9800
22000	E.R.CLIMB 0%	164	OFF	28050	26450	23900	21500
	E.R.CLIMB1.1%	164	OFF	24750	22150	20050	16950
	MIN. CRUISE	194	OFF	29700	27600	25100	22600
	L.R. CRUISE	220	OFF	27700	24400	22200	18900
	L.R. CRUISE	194	ON	24900	20100	17000	12600
20000	E.R.CLIMB 0%	156	OFF	30100	28950	26500	24100
	E.R.CLIMB 1.1%	156	OFF	26950	25300	22750	20300
	MIN. CRUISE	185	OFF	31600	30200	27500	25000
	L.R. CRUISE	210	OFF	30000	27300	24800	22100
	L.R. CRUISE	210	ON	27300	23200	20400	16900
18000	E.R.CLIMB 0%	146	OFF	32000	31350	29450	26650
	E.R.CLIMB 1.1%	146	OFF	29200	28150	25700	23300
	MIN. CRUISE	175	OFF	33400	32600	30500	27700
	L.R. CRUISE	200	OFF	32400	30200	27400	24800
	L.R. CRUISE	200	ON	29700	25900	22900	19000

NOTE:

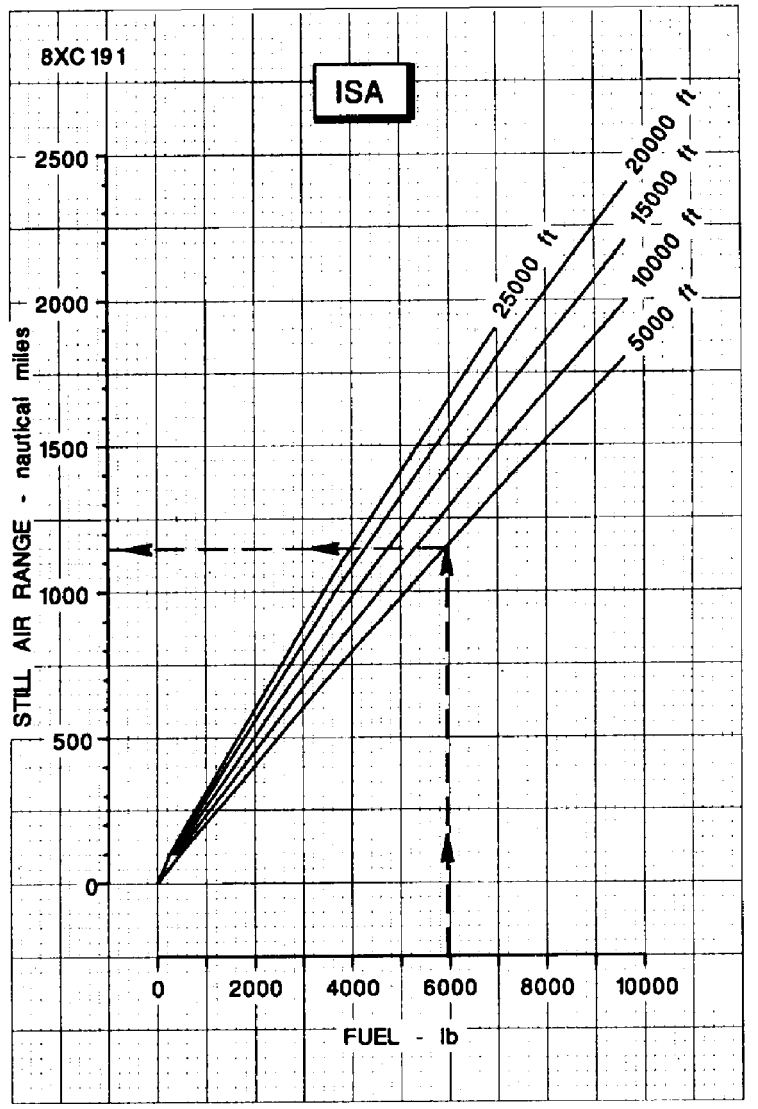
These ceilings are based on average performance with the operative engine running at Maximum Continuous Thrust. To check obstacle clearance, use the ENROUTE NET GRADIENT in the Aircraft Flight Manual. Flight Manual enroute net ceilings with zero net gradient are presented in the table on the following page.

Table PER-63. OBSTICLE CLEARANCE—CRUISE CEILING FOR ZERO ENROUTE NET GRADIENT

CRUISE WEIGHT lb	TEMPERATURE relative to ISA °C							
	-15	-10	-5	0	5	10	15	20
	MAXIMUM CRUISE ALTITUDE ft							
29000	17300	16300	15100	13800	12500	10900	9100	7100
	11000	9600	8200	7000	5500	3200	200	--
28000	18600	17500	16200	14900	13600	12600	10400	8500
	12300	11100	9700	8400	7100	5200	2500	---
27000	19800	18700	17500	16200	14700	13300	11700	9800
	13800	12600	11200	9800	8400	6800	4500	1200
26000	21200	20000	18800	17500	16100	14600	13000	11200
	15100	14000	12700	11400	10000	8300	6300	3700
25000	22000	21000	19800	18500	17200	15600	14000	12100
	16300	15200	14100	12700	11500	9800	8100	5800
24000	23000	22000	21000	19700	18300	16800	15200	13400
	17500	16300	15100	13800	12500	11000	9300	7300
23000	24200	23200	22100	21000	19700	18200	16700	14800
	18800	17700	16500	15200	13900	12500	10800	8900
22000	25200	24100	23200	22200	21000	19600	18000	16200
	20000	18800	17700	16400	15100	13600	12100	10100
21000	26300	25500	24500	23500	22300	21000	19500	17700
	21300	20200	19000	17700	16500	15100	13600	11800
20000	27500	26600	25700	24700	23700	22500	21000	19400
	23000	21900	20700	19500	18200	16700	15200	13400
19000	28600	27800	27000	26000	24800	23600	22300	20700
	24400	23400	22300	21100	19800	18300	16700	14800
18000	29800	29100	28300	27500	26400	25200	24000	22600
	26100	25000	23800	22700	21400	20000	18500	16700

NOTES:

1. *With ENGINE ANTICE ON use shaded values.*
2. *These altitudes are based upon Aircraft Flight Manual Fig.5.40.1.*



NOTES Calculated for 17000lb ZFW.
For each 1000lb increase, range is about 2.5% less.
To find cruise range for a given fuel quantity, read graph with present fuel and with fuel required to remain, then take difference in range.

Figure PER-74. Range After Engine Failure

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Table PER-64. SINGLE ENGINE DRIFTDOWN—ISA (SHEET 1 of 2)

NOTE:

These ceilings are based on average performance at Maximum Continuous Thrust and a constant drift down KIAS (minimum cruise speed at start of drift down weight). To check obstacle clearance use the ENROUTE NET GRADIENT in the Aircraft Flight Manual which will give a lower ceiling than the final drift down altitudes below.

ALTITUDE ft AT ENGINE FAILURE	WEIGHT lb AT ENGINE FAILURE	20000	21000	22000	23000	24000	25000	26000	27000
43000	CONSTANT KIAS	185	189	194	198				
	IOAT AT START °C	-43	-43	-42	-42				
	TIME min	53	51	54	57				
	DISTANCE nm	269	265	284	300				
	FUEL USED lb	810	805	890	970				
	FINAL ALTITUDE ft	29920	29870	28700	27420				
41000	CONSTANT KIAS	185	189	194	198	202	206		
	IOAT AT START °C	-44	-44	-43	-43	-42	-42		
	TIME min	50	49	52	55	57	59		
	DISTANCE nm	254	253	273	289	301	312		
	FUEL USED lb	780	785	870	950	1020	1085		
	FINAL ALTITUDE ft	30050	29860	28680	27410	26120	24840		
39000	CONSTANT KIAS	185	189	194	198	202	206	210	214
	IOAT AT START °C	-45	-45	-44	-44	-43	-43	-42	-42
	TIME min	48	46	50	53	55	58	60	61
	DISTANCE nm	240	239	259	276	289	301	312	321
	FUEL USED lb	750	755	845	925	1000	1065	1135	1200
	FINAL ALTITUDE ft	30020	29840	28680	27380	26100	24820	23590	22440
37000	CONSTANT KIAS	185	189	194	198	202	206	210	214
	IOAT AT START °C	-46	-46	-45	-45	-45	-44	-44	-43
	TIME min	44	44	48	51	53	56	58	59
	DISTANCE nm	222	223	245	261	275	288	299	310
	FUEL USED lb	710	720	815	895	970	1040	1110	1175
	FINAL ALTITUDE ft	29990	29800	28630	27380	26080	24800	23570	22420
35000	CONSTANT KIAS	185	189	194	198	202	206	210	214
	IOAT AT START °C	-45	-45	-44	-44	-43	-43	-42	-42
	TIME min	41	40	44	48	51	53	55	57
	DISTANCE nm	201	204	227	245	260	274	285	297
	FUEL USED lb	660	675	770	855	935	1010	1080	1150
	FINAL ALTITUDE ft	29950	29760	28580	27320	26040	24770	23540	22390

Table PER-64. SINGLE ENGINE DRIFTDOWN—ISA (SHEET 2 of 2)

NOTE:

These ceilings are based on average performance at Maximum Continuous Thrust and a constant drift down KIAS (minimum cruise speed at start of drift down weight). To check obstacle clearance use the ENROUTE NET GRADIENT in the Aircraft Flight Manual which will give a lower ceiling than the final drift down altitudes below.

ALTITUDE ft AT ENGINE FAILURE	WEIGHT lb AT ENGINE FAILURE	20000	21000	22000	23000	24000	25000	26000	27000
33000	CONSTANT KIAS	185	189	194	198	202	206	210	214
	IOAT AT START °C	-42	-41	-41	-40	-40	-40	-39	-39
	TIME min	35	35	40	44	47	50	53	55
	DISTANCE nm	172	178	204	225	242	258	270	282
	FUEL USED lb	575	605	710	805	885	965	1040	1110
	FINAL ALTITUDE ft	29880	29690	28520	27270	26000	24730	23510	22370
31000	CONSTANT KIAS	185	189	194	198	202	206	210	214
	IOAT AT START °C	-38	-38	-38	-37	-37	-36	-36	-36
	TIME min	25	27	34	39	43	47	50	52
	DISTANCE nm	123	135	172	198	218	237	252	265
	FUEL USED lb	425	470	610	725	820	910	985	1065
	FINAL ALTITUDE ft	29750	29560	28420	27190	25940	24680	23470	22330
29000	CONSTANT KIAS			194	198	202	206	210	214
	IOAT AT START °C			-34	-34	-33	-33	-33	-32
	TIME min			22	31	37	42	45	48
	DISTANCE nm			109	156	187	211	229	245
	FUEL USED lb			400	585	715	825	915	1005
	FINAL ALTITUDE ft			28190	27050	25840	24600	23410	22280
27000	CONSTANT KIAS				198	202	206	210	214
	IOAT AT START °C				-30	-30	-30	-29	-29
	TIME min				15	27	35	40	44
	DISTANCE nm				72	136	174	199	220
	FUEL USED lb				280	535	700	815	920
	FINAL ALTITUDE ft				26680	25660	24480	23330	22210
25000	CONSTANT KIAS								
	IOAT AT START °C								
	TIME min								
	DISTANCE nm								
	FUEL USED lb								
	FINAL ALTITUDE ft								



Table PER-65. SINGLE ENGINE LONG RANGE CRUISE—11,000 FEET

CRUISE WEIGHT lb	TEMPERATURE RELATIVE TO ISA °C	-15	-10	-5	0	+5	+10	+15	+20
	AMBIENT TEMP °C	-22	-17	-12	-7	-2	3	8	13
	IOAT °C	-17	-12	-7	-2	3	8	13	19
18000	KTAS	225	227	229	231	233	236	238	240
	TOTAL FUEL FLOW lb/hr	976	989	1002	1015	1029	1043	1056	1069
	KIAS	200	200	200	200	200	200	200	200
20000	KTAS	236	238	241	243	245	247	250	252
	TOTAL FUEL FLOW lb/hr	1070	1086	1101	1116	1131	1145	1159	1173
	KIAS	210	210	210	210	210	210	210	210
22000	KTAS	247	250	252	254	257	259	261	264
	TOTAL FUEL FLOW lb/hr	1173	1189	1206	1222	1238	1253	1268	1284
	KIAS	220	220	220	220	220	220	220	220
24000	KTAS	258	261	263	266	268	271	273	275
	TOTAL FUEL FLOW lb/hr	1278	1294	1311	1328	1346	1362	1379	1395
	KIAS	230	230	230	230	230	230	230	230
26000	KTAS	269	272	274	277	280	282	285	287
	TOTAL FUEL FLOW lb/hr	1383	1400	1419	1439	1457	1475	1493	1510
	KIAS	240	240	240	240	240	240	240	240



Table PER-66. SINGLE ENGINE LONG RANGE CRUISE—13,000 FEET

CRUISE WEIGHT lb	TEMPERATURE RELATIVE TO ISA °C	-15	-10	-5	0	+5	+10	+15	+20
	AMBIENT TEMP °C	-26	-21	-16	-11	-6	-1	4	9
	IOAT °C	-21	-16	-11	-5	0	5	10	15
18000	KTAS	232	234	236	239	241	243	245	248
	TOTAL FUEL FLOW lb/hr	966	979	993	1007	1021	1035	1048	1062
	KIAS	200	200	200	200	200	200	200	200
20000	KTAS	243	246	248	250	253	255	257	260
	TOTAL FUEL FLOW lb/hr	1062	1078	1093	1108	1123	1137	1151	1166
	KIAS	210	210	210	210	210	210	210	210
22000	KTAS	254	257	260	262	265	267	269	272
	TOTAL FUEL FLOW lb/hr	1163	1180	1196	1212	1227	1243	1258	1273
	KIAS	220	220	220	220	220	220	220	220
24000	KTAS	266	268	271	274	276	279	281	284
	TOTAL FUEL FLOW lb/hr	1267	1283	1300	1317	1334	1352	1369	1385
	KIAS	230	230	230	230	230	230	230	230
26000	KTAS	277	280	283	285	288	291	293	289
	TOTAL FUEL FLOW lb/hr	1372	1388	1409	1430	1449	1466	1483	1455
	KIAS	240	240	240	240	240	240	240	234

NOTE: Shaded values are for the maximum speed attainable at the given conditions

Table PER-67. SINGLE ENGINE LONG RANGE CRUISE—15,000 FEET

CRUISE WEIGHT lb	TEMPERATURE RELATIVE TO ISA °C	-15	-10	-5	0	+5	+10	+15	+20
	AMBIENT TEMP °C	-30	-25	-20	-15	-10	-5	0	5
	IOAT °C	-24	-19	-14	-9	-4	1	6	11
18000	KTAS	239	241	244	246	249	251	253	256
	TOTAL FUEL FLOW lb/hr	955	970	984	998	1012	1026	1040	1054
	KIAS	200	200	200	200	200	200	200	200
20000	KTAS	251	253	256	258	261	263	266	268
	TOTAL FUEL FLOW lb/hr	1053	1069	1084	1098	1113	1127	1142	1157
	KIAS	210	210	210	210	210	210	210	210
22000	KTAS	262	265	268	270	273	276	278	281
	TOTAL FUEL FLOW lb/hr	1153	1170	1185	1200	1216	1232	1248	1264
	KIAS	220	220	220	220	220	220	220	220
24000	KTAS	274	277	280	282	285	288	290	293
	TOTAL FUEL FLOW lb/hr	1257	1272	1288	1308	1327	1344	1360	1371
	KIAS	230	230	230	230	230	230	230	230
26000	KTAS	286	289	292	294	297	300	296	282
	TOTAL FUEL FLOW lb/hr	1365	1386	1406	1425	1442	1462	1436	1366
	KIAS	240	240	240	240	240	240	234	221

NOTE: ***Shaded values are for the maximum speed attainable at the given conditions***



Table PER-68. SINGLE ENGINE LONG RANGE CRUISE—17,000 FEET

CRUISE WEIGHT lb	TEMPERATURE RELATIVE TO ISA °C	-15	-10	-5	0	+5	+10	+15	+20
	AMBIENT TEMP °C	-34	-29	-24	-19	-14	-9	-4	1
	IOAT °C	-28	-23	-18	-13	-8	-2	3	8
18000	KTAS	246	249	251	254	256	259	261	264
	TOTAL FUEL FLOW lb/hr	946	961	976	990	1004	1017	1031	1045
	KIAS	200	200	200	200	200	200	200	200
20000	KTAS	258	261	264	266	269	271	274	276
	TOTAL FUEL FLOW lb/hr	1044	1059	1075	1089	1103	1118	1134	1149
	KIAS	210	210	210	210	210	210	210	210
22000	KTAS	270	273	276	279	281	284	287	289
	TOTAL FUEL FLOW lb/hr	1146	1162	1176	1191	1209	1226	1242	1257
	KIAS	220	220	220	220	220	220	220	220
24000	KTAS	282	285	288	291	294	297	300	291
	TOTAL FUEL FLOW lb/hr	1252	1269	1289	1308	1325	1340	1359	1310
	KIAS	230	230	230	230	230	230	230	221
26000	KTAS	294	298	301	304	306	304	292	
	TOTAL FUEL FLOW lb/hr	1372	1391	1410	1430	1450	1430	1369	
	KIAS	240	240	240	240	240	235	224	

NOTE: Shaded values are for the maximum speed attainable at the given conditions

Table PER-69. CEILING DATA

MAXIMUM CRUISE ALTITUDE

TEMPERATURE RELATIVE TO ISA° C								
	–15	–10	–5	0	+5	+10	+15	+20
WEIGHT LB	MAXIMUM CRUISE ALTITUDE FT							
27,000	40600	40400	39800	39100	38300	37400	36400	34300
26,000	41300	41200	40600	39900	39000	38100	37100	35400
25,000	42100	41900	41300	40700	39800	38700	37700	36400
24,000	42900	42700	42200	41600	40600	39500	38400	37100
23,000	43000	43000	43000	42400	41400	40400	39200	38000
22,000	43000	43000	43000	43000	42200	41200	40000	38800
21,000	43000	43000	43000	43000	42900	42000	40800	39600
20,000	43000	43000	43000	43000	43000	42700	41600	40500

SEE NOTE

MAXIMUM CRUISE WEIGHT

TEMPERATURE RELATIVE TO ISA° C								
	–15	–10	–5	0	+5	+10	+15	+20
CRUISE ALTITUDE F	MAXIMUM CRUISE WEIGHT LB							
35,000								26400
36,000								25500
37,000							26100	24100
38,000						26100	24600	22900
39,000					25900	24600	23200	21700
40,000			26700	25900	24800	23500	22000	20600
41,000	26400	26300	25400	24700	23600	22300	20700	19300
42,000	25100	24900	24200	23500	22300	21000	19500	18100
43,000	23800	23700	23000	22300	21000	19700	18200	

SEE NOTE

MAXIMUM TAKEOFF WEIGHT FOR CRUISE ALTITUDE

TEMPERATURE RELATIVE TO ISA° C								
	–15	–10	–5	0	+5	+10	+15	+20
CRUISE ALTITUDE F	MAXIMUM TAKEOFF WEIGHT LB							
35,000								28000
36,000								27100
37,000							27500	25600
38,000						27400	25900	24300
39,000					27100	25800	24500	23000
40,000			27800	27100	26000	24700	23200	21900
41,000	27500	27400	26500	25800	24700	23400	21900	20500
42,000	26100	25900	25300	24600	23400	22100	20600	19200
43,000	24800	24700	24000	23300	22000	20700	19200	

NOTE: THESE WEIGHTS AND ALTITUDES ARE DETERMINED BY EITHER THE MAXIMUM ALTITUDE OF 43,000 FT, OR BY A 200 FT/MIN RATE OF CLIMB LIMIT AT M = 0.7

CREW RESOURCE MANAGEMENT

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CREW RESOURCE MANAGEMENT (CRM)

CREW CONCEPT BRIEFING GUIDE

INTRODUCTION

To a large extent the success of any aircrew depends on how effectively crewmembers coordinate their actions using standardized and approved procedures. In other chapters you have been exposed to standardized maneuvers, procedures and checklists. This chapter is designed to illustrate standard aircrew calls and briefing guidelines that when used in logical sequence with aircrew checklists and flight procedures can improve aircrew efficiency and enhance safety. These callouts and briefings are only recommendations to be used in a larger system of standard operating procedures that when combined become the core of an effective crew resource management program. They are not intended to supersede any individual company SOP, but are examples of good operating practices.

COMMON TERMS

PIC Pilot in Command

Designated by the company for flights requiring more than one pilot. Responsible for conduct and safety of the flight. Designates pilot flying and pilot not flying duties.

PF Pilot Flying

Controls the aircraft with respect to assigned airway, course, altitude, airspeed, etc., during normal and emergency conditions. Accomplishes other tasks as directed by the PIC.

PNF Pilot Not Flying

Maintains ATC communications, copies clearances, accomplishes checklists and other tasks as directed by the PIC.

B Both

PRETAKEOFF BRIEFING (IFR/VFR)

NOTE

The following briefing is to be completed during item 1 of the Pretakeoff checklist. The pilot flying will accomplish the briefing.

1. Review the ATC clearance and departure procedure (route and altitude, type of takeoff, significant terrain features, etc.).

2. Review those items that are not standard procedure to include deferred or MEL items (if applicable).

3. Review required callouts, unless standard calls have been agreed upon, in which case a request for "Standard Callouts" may be used.

4. Review the procedures to be used in case of an emergency on departure.

5. As a final item, ask if there are any questions.

CREW COORDINATION DURING THE APPROACH SEQUENCE

NOTE

The following crew coordination approach sequence should be completed as early as possible, prior to initiating an IFR approach.

PF—Requests the pilot not flying to obtain destination weather. (Transfer of communication duties to the pilot flying may facilitate this task.)

PNF—Advises the pilot of current destination weather, approach in use, and special information pertinent to the destination.

PF—Requests the pilot not flying to perform the approach setup.

PNF—Accomplishes the approach setup and advises of frequency tuned, identified and course set.

PF—Transfers control of the aircraft to the pilot not flying, advising, "You have control, heading _____, altitude _____" and special instructions. (Communications duties should be transferred back to the pilot not flying at this point.)

PNF—Responds, "I have control, heading ____, altitude ____."

PF—The pilot who will fly the approach will review, then brief the approach procedure.

PF—Advises, "I have control, heading ____, altitude ____."

PNF—Confirms "You have control, heading ____, altitude ____."

NOTE

The above sequence should be completed prior to the FAF.

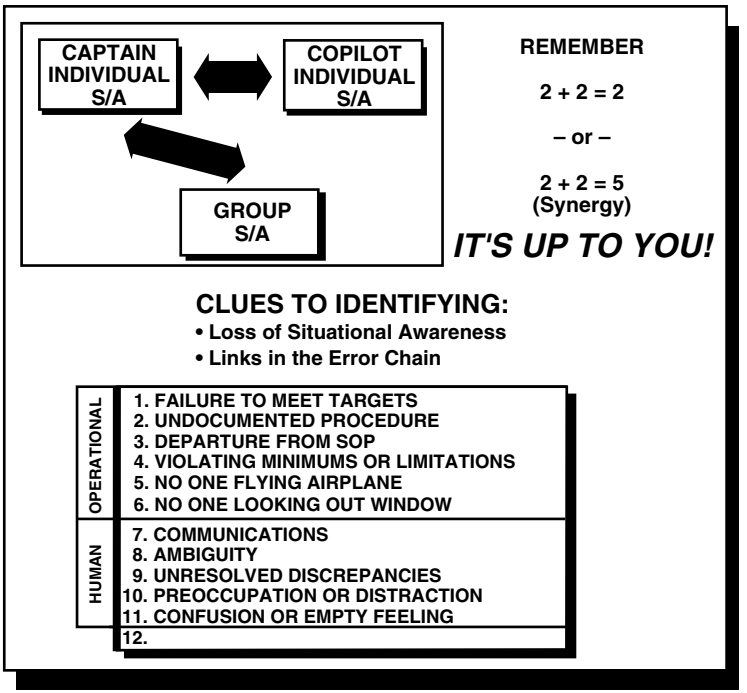


Figure CRM-1. Situation Awarness in the cockpit

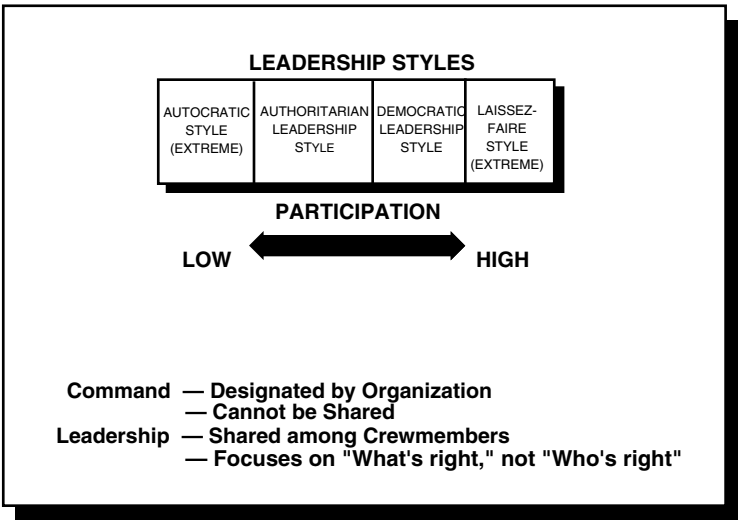


Figure CRM-2. Command and Leadership

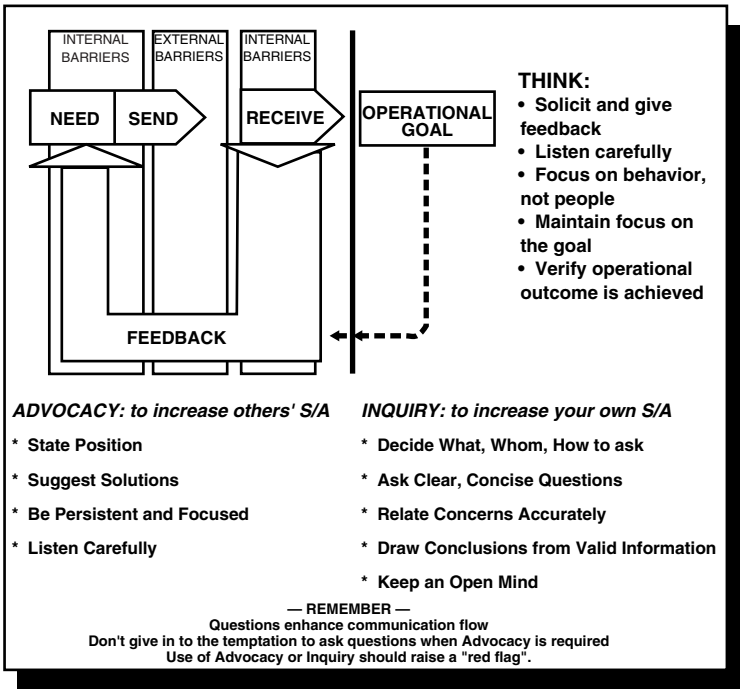

INTERNAL BARRIERS
EXTERNAL BARRIERS
INTERNAL BARRIERS
NEED
SEND
RECEIVE
OPERATIONAL GOAL
FEEDBACK
THINK:
• Solicit and give feedback
• Listen carefully
• Focus on behavior, not people
• Maintain focus on the goal
• Verify operational outcome is achieved
ADVOCACY: to increase others' S/A
* State Position
* Suggest Solutions
* Be Persistent and Focused
* Listen Carefully
INQUIRY: to increase your own S/A
* Decide What, Whom, How to ask
* Ask Clear, Concise Questions
* Relate Concerns Accurately
* Draw Conclusions from Valid Information
* Keep an Open Mind
— REMEMBER —
Questions enhance communication flow
Don't give in to the temptation to ask questions when Advocacy is required
Use of Advocacy or Inquiry should raise a "red flag".

Figure CRM-3. Communication Process

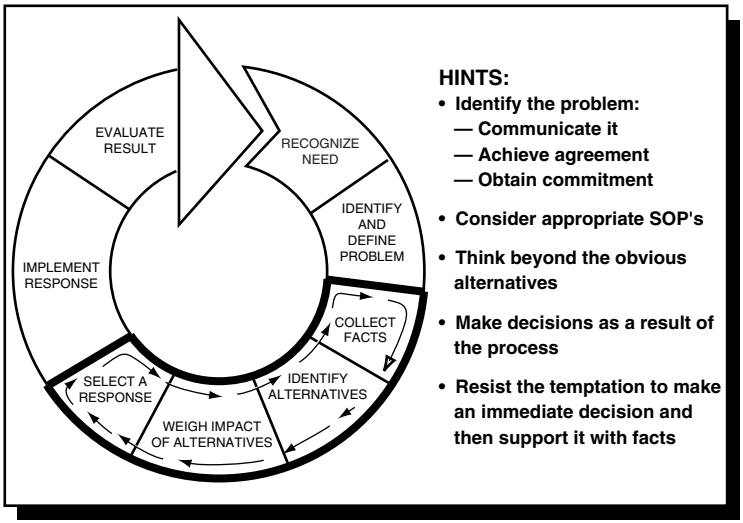

EVALUATE RESULT
RECOGNIZE NEED
IDENTIFY AND DEFINE PROBLEM
COLLECT FACTS
IDENTIFY ALTERNATIVES
WEIGH IMPACT OF ALTERNATIVES
SELECT A RESPONSE
IMPLEMENT RESPONSE
HINTS:
• Identify the problem:
— Communicate it
— Achieve agreement
— Obtain commitment
• Consider appropriate SOP's
• Think beyond the obvious alternatives
• Make decisions as a result of the process
• Resist the temptation to make an immediate decision and then support it with facts

Figure CRM-4. Decision Making Process

ALTITUDE CALLOUTS

ENROUTE

1000 Feet Prior to Level Off

PNF	PF
State altitude leaving and assigned level off altitude	"CHECKED"
"200 above/below"	"LEVELING"

APPROACH—PRECISION

PNF	PF
At 1,000 ft above minimums	
"1,000 feet above"	"DH ____"
At 500 ft above minimums	
"500 feet above minimums"	"NO FLAGS"
At 100 ft above minimums	
"100 feet above"	
At decision height (DH)	
"Decision Height, approach lights at(clock position)"	"CONTINUING" OR "LANDING"
OR	
"Decision Height, runway at (clock position)"	"CONTINUING" OR "LANDING"
OR	
"Decision Height, runway not in sight"	"MISSED APPROACH"

APPROACH—NONPRECISION

PNF	PF
At 1,000 ft above MDA	
"1,000 feet above"	"MDA ____"
At 500 ft above MDA	
"500 feet above."	"NO FLAGS"
At 100 ft above MDA	
"100 feet above."	
At minimum descent altitude (MDA)	
"MDA"	"MAINTAINING MDA"
At or Prior to the missed approach point (MAP)	
"Approach lights at (clock position)"	"CONTINUING" OR "LANDING"
"Runway at (clock position)"	"CONTINUING" OR "LANDING"
"Runway not in sight"	"MISSED APPROACH"

SIGNIFICANT DEVIATION CALLOUTS

PNF	PF
IAS ± 10 KIAS	
"VREF ± ____"	"CORRECTING TO ____"
Heading ± 10° enroute, 5° on approach	
"Heading ____ degrees left/right"	"CORRECTING TO ____"
Altitude ± 100 ft enroute, + 50/-0 ft on final approach	
"Altitude ____ high/low"	"CORRECTING TO ____"
CDI left or right one dot	
"Left/right of course ____ dot"	"CORRECTING"

RMI course left or right ±5°

"Left/right of course ____ degrees" "CORRECTING"

Vertical descent speed greater than 1,000 fpm on final approach

"Sink rate ____" "CORRECTING"

Bank in excess of 30°

"Bank ____ degrees" "CORRECTING"



SYLLABUS

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SYLLABUS

INTRODUCTION

This is your *Recurrent Training Manual*. It should accompany you during your scheduled training at the FlightSafety Learning Center in Wilmington or Houston.

This syllabus has been prepared to serve as a general outline to assist you while you attend this course. Normally it serves as a guide for the instructor, but deviations will occur. Occasionally changes must be made due to unforseen circumstances to accommodate training in the most effective manner. Some syllabus variations exist between the Wilmington and Houston Learning Centers; if some items are not covered where or when indicated, they will be covered at a different time.

We at FlightSafety look forward to your attendance and are prepared to answer any additional questions you have.

GENERAL INFORMATION

The pilot recurrent training consists of the following:

- Classroom hours 12*
- Simulator hours 6
- Briefing hours 3

Total 22

*Up to 12 hours of optional subjects are offered.

GROUND SCHOOL COURSE OUTLINE

Following are the subjects and normal classroom hours for the pilot recurrent ground school:

- Electrical network 2.0
- Hydraulic systems 1.5
- Powerplant 1.5
- Performance 3.0
- Fuel system 1.0
- Air conditioning and pressurization 1.5
- Miscellaneous 1.0
- Review 0.5

Total 12.0

WILMINGTON SYLLABUS

GROUND SCHOOL LESSON GUIDES

Electrical Network

2.0 hours are required to cover the following:

- DC system
  - Batteries
  - Generators
  - Ground power unit
  - APU generator
  - Distribution
  - Control and operation
  - Normal and emergency procedures
  - Failure analysis
- AC system
  - Inverters
  - Alternator windshield heat
  - Distribution
  - Control and operation
  - Normal and emergency procedures
  - Failure analysis

Hydraulic Systems

1.5 hours are required to cover the following:

- General description .
- Main system
  - Power sources
    - Engine-driven pumps
    - Hand pumps
  - Protection
  - Indication
- Auxiliary system
  - Subsystems
    - Wheel brakes
    - Normal
    - Emergency
  - Landing gear
  - Flaps
  - Airbrakes
  - Mach trim
  - Stall warning and identification
- Normal and emergency procedures
- Failure analysis

Powerplant

1.5 hours are required to cover the following:

- Thrust reversers
- Engine fuel
- DEEC
- SYNC
- APR
- Engine operation
- Normal and emergency procedures
- Failure analysis

Performance

3.0 hours are required to cover the following:

- Operation limitations
- Performance information
- Takeoff performance
- Climb performance
- Obstacle clearance
- Enroute performance
- Landing performance
- Flight planning
- Weight and balance

Fuel System

1.0 hour is required to cover the following:

- Servicing
- Refueling
- Pressure
  - Control
  - Protection
- Distribution
  - Boost pumps
  - Jet pumps
  - Engine pumps
  - Crossfeed and transfer
- Limitations
  - Warning indicators and lights
- Normal and emergency procedures
- Failure analysis

Air Conditioning and Pressurization

1.5 hours are required to cover the following:

- Air conditioning
  - Air Cycle machine
    - Normal system operation
    - Flight deck heat
    - Duct distribution
  - Temperature control
    - Automatic
    - Manual

- Failure analysis

- Pressurization
  - Control
    - Normal
    - Emergency
  - Limitations
  - Normal and emergency procedures
  - Failure analysis

Miscellaneous and Review

1.5 hours total are allowed for miscellaneous subjects, general review, and test if required.

SIMULATOR PERIODS

Period No. 1

Briefing and takeoff data—1.0 hours

Simulator flight—2.0 hours

1. Starting checks and starting malfunctions
2. Pretakeoff checks (emphasize EFIS equipment)
3. Normal takeoff (weight, flap setting, and noise abatement—optional)
4. Climb to altitude (intermediate), enter holding
5. Airwork
   - Engine shutdown and relight
   - Approaches to stall
   - Unusual attitudes (includes instrument failure)
6. Normal descent
7. Nonprecision approach
8. Published missed approach
9. ILS to landing
10. Systems work
    - Electrical system
    - Fuel system (including fuel pump failure)

*LOC (BC) approaches

*Black hole approach

Debriefing—0.5 hour

NOTE

- The numbered items are required for completion of the period.
- Starred items are extra if time permits.
- Systems work of sufficient detail must be completed to assure proper procedure and understanding.

EMPHASIZE USE OF CHECKLISTS, CREW COORDINATION, AND OVERALL COCKPIT RESOURCE MANAGEMENT

Period No. 2

Briefing and takeoff data—1.0 hours

Simulator flight—2.0 hours

1. Starting checks (optional)
2. Pretakeoff checks
3. Aborted takeoffs
   - Dry runways
   - Slippery runways
4. V_1 cuts (must include one performance-limited with over weight landing)
5. Single-engine ILSs
6. Single-engine nonprecision approaches
7. Single-engine missed approach procedure
8. Circling approaches
9. Hydraulic systems (must include use of emergency braking)

*Landing with gear malfunctions

Debriefing—0.5 hours

NOTE

- The numbered items are required for completion of the period.
- Starred items are extra if time permits.
- Systems work of sufficient detail must be completed to assure proper procedure and understanding.

EMPHASIZE USE OF CHECKLISTS, CREW COORDINATION, AND OVERALL COCKPIT RESOURCE MANAGEMENT

Period No. 3

Briefing and takeoff data—1.0 hours

Simulator flight—2.0 hours

1. Starting checks (optional)
2. Pretakeoff checks
3. Slippery runway abort
4. Slippery runway takeoff
5. Climb in icing conditions
6. Systems work
   - Pressurization
   - Air conditioning
7. Rapid decompression and emergency descent
8. Subtle incapacitation (see note)
9. Windshear (must include at least two profiles)

*Client requests

General systems review

Debriefing—0.5 hours

NOTE

The numbered items are required for completion of the period.

- Starred items are extra if time permits.
- Systems work of sufficient detail must be completed to assure proper procedure and understanding.
- Make sure all FAR 61.58 requirements are completed.
- Subtle incapacitation with complete crew only.

EMPHASIZE USE OF CHECKLISTS, CREW COORDINATION, AND OVERALL COCKPIT RESOURCE MANAGEMENT

HOUSTON SYLLABUS

GENERAL

This recurrent training syllabus enables trainees to meet the PIC proficiency check requirements of FAR 61.58 and to maintain or regain the recency of experience requirements of FAR 61.57 IAW Exemption 4058 (ATTCH 3).

The course provides cockpit-oriented training in aircraft systems and procedures. The basic course consists of 12 hours of classroom instruction and 6 hours of pilot (12 hours per crew) simulator training. It may be presented as either a three- or a four-day course of training. The course may also be presented as a Cockpit Management Concept (CMC) or an expanded procedure review (EPR) format for trainees who are proficient IAW FlightSafety criteria (successful completion of a standard recurrent syllabus within the preceding 8 months).

The PIC proficiency check for the above courses may be conducted using the progressive testing method authorized by the Manager General Aviation and Commercial Division Memo dated September 16, 1986 (ATTCH 3).

COURSE OBJECTIVE

To present an operationally oriented approach to aircraft systems operation. To develop relevant flight related situations that promote awareness, analysis, and proper cockpit management procedures that will enable the trainee to successfully complete the proficiency check.

COURSE CONTENT

Ground school..... 12.0 HOURS (9–12 HOURS CMC)
Simulator..... 12.0 HOURS (9–12 HOURS CMC)

COMPLETION STANDARDS

The trainee will be able to successfully complete the PIC proficiency check. Trainees must demonstrate knowledge and performance and show through appropriate records that they meet the knowledge, skill, and experience requirements necessary to successfully complete a PIC proficiency check.

- Ground school—Trainees will demonstrate through oral quizzing that they meet the objective specified above and have the knowledge to maintain proficiency in the aircraft.

- Simulator—All flights will be graded IAW Section 4. The trainee will be required to achieve a grade of 1 (Proficient) by completion of simulator training.

COURSE PREREQUISITES

Successful completion of FlightSafety Hawker 800 XP initial pilot training. Exceptions must be approved by the Learning Center Manager.

GROUND SCHOOL LESSON GUIDES

Class Training Course Objectives

Review and reinforce trainee knowledge of systems and procedures.

Classroom Training Course Completion Standards

The trainee will demonstrate an in-depth knowledge of systems and procedures to successfully pass the proficiency check. Trainees will be evaluated during classroom discussion and oral quizzing.

Classroom Training Content

LESSON	SUBJECT
1	Electrical Systems
2	Fuel System
3	Powerplant
4	Hydraulic/Flight Control Systems
5	Air-Conditioning/Pressurization Systems
6	Miscellaneous Systems
7	Performance

Lesson No. 1—Electrical Systems

Objective

Refamiliarization in the operation of the power sources and distribution systems-their control, indication, warning, and limitations. All phases of normal operation, abnormal situations, and emergency procedures will be reviewed.

Content

1. DC Power Distribution
2. AC Power Distribution
3. Normal Procedures
4. Abnormal Procedures
5. Emergency Procedures
6. Limitations

Completion Standards

The student will demonstrate by successful completion of review questions and oral quizzing his ability to operate and control the electrical system in normal and abnormal conditions both in flight and on the ground.



Lesson No. 2—Fuel System

Objective

Refamiliarization in the operation of the fuel system and its normal, abnormal, and emergency procedures.

Content

1. Overview
2. Normal Fuel Distribution System
3. Crossfeed System
4. Transfer Systems
5. Refuel/Defuel System
6. Types of Fuel and Additives
7. Normal Operating Procedures
8. Abnormal Operating Procedures
9. Emergency Procedures
10. Limitations

Completion Standards

The student will demonstrate by successful completion of review questions and oral quizzing that he has the ability to operate and control the fuel system in normal and abnormal conditions.

Lesson No. 3—Powerplant

Objective

Familiarization of the components, operation, and limitations of the Garrett TFE-731-5BR-1H.

Content

1. Overview
2. Lubrication System
3. Fuel System
4. DEEC System
5. Synchronization/APR Systems
6. Thrust Reversers
7. Normal Procedures
8. Abnormal Procedures
9. Emergency Procedures
10. Limitations

Completion Standards

The student will demonstrate by successful completion of review questions and oral quizzing that he has the knowledge and ability to operate and control the powerplant in normal and abnormal conditions, both in flight and on the ground.

Lesson No. 4—Hydraulic/Flight Control Systems

Objective

Refamiliarization with the hydraulic power supply and the various subsystems requiring hydraulic pressure. Normal, abnormal, and emergency procedures and limitations will be reviewed.

Content

1. Overview
2. Hydraulic Power Supply System
3. Landing Gear
4. Wheel Brakes
5. Mach trim
6. Flap System
7. Airbrake System
8. Stall Warning System
9. Normal Procedures
10. Abnormal Procedures
11. Emergency Procedures

Completion Standards

The student will demonstrate by successful completion of review questions and oral quizzing his ability to operate and control the hydraulic power and subsystem in normal and abnormal conditions.

Lesson No. 5—Air Conditioning/Pressurization Systems

Objective

Refamiliarization of the operation of the air-conditioning and pressurization systems under normal, abnormal, and emergency conditions.

Content

1. Overview
2. Pneumatic Supply Systems
3. Air-Conditioning System
4. Air Distribution System
5. Pressurization System
6. Ram-Air System
7. Normal Procedures, Handling, and Operation
8. Abnormal Procedures
9. Emergency Procedures
10. Limitations

Completion Standards

The student will demonstrate by successful completion of review questions and oral quizzing that he has the knowledge and ability to operate and control the air-conditioning and pressurization systems in normal and abnormal conditions.

Lesson No. 6—Miscellaneous Systems

Objective

Refamiliarization of the ice detection/protection system and avionics systems. Normal operations, abnormal situations, emergency procedures, and limitations will be reviewed.

Content

1. Overview
2. Ice Detection System
3. Wing/Tail Anti-ice System
4. Windshield Heat System
5. Pitot/Rudder Bias Heat Systems
6. Engine Anti-ice System
7. Avionics Systems
8. Oxygen Supply System
9. Normal Procedures
10. Emergency Procedures
11. Limitations

Completion Standards

The student will demonstrate by successful completion of review questions and oral quizzing that he has the knowledge and ability to operate and control the ice and rain protection system in normal and abnormal conditions.

Lesson No. 7—Performance

Objective

Refamiliarization in the use of various performance charts and data available in the *Hawker 800 XP Flight Aircraft Manuals*.

Content

1. Review FAR 25 certification requirements as applicable to Hawker 800 XP operations
2. Review tabulated data and "D" value charts
3. Review obstacle clearance performance charts
4. Review climb performance charts
5. Review landing charts

Completion Standards

The student will demonstrate his ability to effectively use the applicable charts by determining the answers to specific problems given by the instructor.



SIMULATOR PERIODS

Period No. 1 — 3.0 Flight Hours

Objective

To develop and review pilot's proficiency in aircraft operation with selected system malfunctions, abnormal and emergency procedures, basic airwork, and crew coordination, and overall cockpit resource management.

Preflight (Duration: 30-60 Minutes)

Briefing

Preparation of "Told" card

Flight (Crew 2; Duration: 1.5 Hours Left Seat Each Pilot)

- Starting engines, powerplant checks
- Taxiing and normal takeoff
- Airwork: approach to stall series, steep turns, unusual attitude recoveries; engine shutdown and relight
- Normal nonprecision, precision, and missed approach
- System management, normal and abnormal procedures
    - Electrical System
    - EFIS

Postflight (Duration: 15-30 Minutes)

Debriefing and assignment

Completion Standards

Pilot is able to demonstrate proper system knowledge by correctly identifying and solving all abnormal and emergency operations briefed. Airwork will be satisfactory when performance is to within the acceptable performing guidelines.

Period No. 2 — 3.0 Flight Hours

Objective

To develop and review pilot's proficiency in aircraft operation with selected system malfunctions, abnormal procedures, emergency procedures, crew coordination, and overall cockpit resource management.

Preflight (Duration: 30-60 Minutes)

Briefing

Preparation of "Told" card

Flight (Crew 2; Duration: 1.5 Hours Left Seat Each Pilot)

- Starting engine, start malfunctions, taxiing
- Takeoffs; rejected (dry runway) engine failure at V_1
- Single-engine nonprecision, precision, and missed approaches and two engine no-flap landing
- System management, normal and abnormal procedures
- Hydraulics and Flight Controls
- Powerplant

Postflight (Duration: 15-30 Minutes)

Debriefing and assignment

Completion Standards

Pilot is able to perform all normal and emergency procedures covered in briefing.



Period No. 3 — 3.0 Flight Hours

Objective

To develop and review pilot's proficiency in aircraft operation with selected system malfunctions, abnormal procedures, emergency procedures, crew coordination, and overall cockpit resource management.

Preflight (Duration: 30-60 Minutes)

Briefing

Preparation of "Told" card

Flight (Crew 2; Duration: 1.5 Hours Left Seat Each Pilot)

- Cold weather operations
- Starting engines, taxiing
- Takeoffs; rejected (wet runway) and instrument takeoff
- Rapid decompression and emergency descent
- Precision and circling approaches
- System management, normal and abnormal procedures
- Pressurization/Air Conditioning
- Ice and Rain Protection
- Fuel System

Postflight (Duration 15-30 Minutes)

Debriefing and assignment

Completion Standards

Pilot is able to perform all normal, abnormal, and emergency procedures.

Period No. 4 — 3.0 Flight Hours

Objective

To develop and review pilot's proficiency in aircraft operation with selected system malfunctions, abnormal procedures, emergency procedures, crew coordination, and overall cockpit resource management.

Preflight (Duration: 30-60 Minutes)

Briefing

Preparation of "Told" card

Flight (Crew 2; Duration: 1.5 Hours Left Seat Each Pilot)

- Hot weather operation
- Starting engines, taxiing
- Engine failure at V_1 (WAT and obstacle limited) and overweight landing
- Windshear
- Nonprecision and black hole approaches
- Systems review

Postflight (Duration 15-30 Minutes)

Debriefing

Completion Standards

Pilot is able to perform all normal, abnormal, and emergency procedures. Training will be complete when performance is to within the established performance guidelines.

NOTE

Pilot is able to successfully complete all FAR 61.58 requirements.

COCKPIT MANAGEMENT CONCEPT (CMC)

Course Content

Day I	Systems and Procedures Review	Simulator
Day 2	CMC Briefing and Interactive Video	Simulator LOFT
Day 3	Pilot Enrichment	Simulator

Enrichment Prerequisites

The client must have successfully completed a FlightSafety recurrent pilot training program within the preceding 8 months. Individuals who do not meet the prerequisite must be approved by the Learning Center Manager.

CMC Recurrent Course Objectives

Ensure students have a competent level of technical and procedural knowledge through review and reinforcement as needed.

Enhance situational awareness by creating operational scenarios that expand and challenge situational awareness.

Develop skills in cockpit and systems management in a realistic operational/flight environment.

Day No. 1—Sysytems And Procedures Review

Training Objectives

The objective of this period is to develop a sound operationally oriented approach to aircraft systems management.

Training Completion Standards

The student will demonstrate through oral quizzing that he meets the objective specified above and has the knowledge to maintain his proficiency in the aircraft.

CMC Introduction/Review

Review as appropriate for initial CMC or continuation of CMC program.

System Review 3.0 Hours

The review will be conducted either as a system by system review or as a checklist-oriented procedures review that determines depth of systems knowledge:

SYSTEM-BY-SYSTEM REVIEW

Aircraft General

Fuel

Powerplant and APU

Warning System

Ice and Rain Protection

Pneumatics

Hydraulic

Gear and Brakes

Flight Controls

Electrical

Lighting

Avionics

Fire Protection

Oxygen

Performance/Weight and Balance

CHECKLIST-ORIENTED REVIEW (EXPANDED PROCEDURES REVIEW)

- Prechecklist mission planning
  - Weight and Balance
  - Performance
  - Fuel requirements
  - Departure restrictions
- Preflight
  - Common faults
  - Cold/hot weather concerns
- Checklists
  - Normal
- Emergency and abnormal (Interjected at appropriate points to promote discussion)

Day No. 1—CMC Simulator Syllabus

Briefing and Performance Data **.5 to 1.0 Hours**

Simulator Profile **Crew** **3.0 to 4.0 Hours**

Single pilot **1.5 to 2.0 Hours**

- Normal takeoff and departure
- Climb
- Airwork
  - Approach to stall
  - Steep turns
  - Unusual attitudes
  - Flight characteristics
- Descent to holding
  - Nonprecision approach to circle and land
  - Takeoff engine failure after V_1
  - Single-engine approach and missed
  - Malfunctions in all major systems* during the flight

Debriefing

- Critique
- Assignment for Day 2

*Aircraft systems operation and malfunctions of sufficient complexity to assure proper analysis and execution of procedures

EMPHASIZE USE OF CHECKLISTS AND COCKPIT MANAGEMENT SKILLS.

Day No. 2—Practical Cockpit Management

Training Objective

CMC

- Provide training on selected subjects associated with cockpit management:
- Situational awareness
  - Distractions
  - Stress
  - Use of checklists
  - Workload/time management
  - Decision making/judgment
  - Cockpit management resources
  - Flight planning/progress monitoring
  - Managing people
  - Pattern recognition
- Completion standards

  Review related articles in the student workbook. Review the interactive video program, and answer the questions contained in each unit. Discuss.
- Introduction to CMC unit
  - Interactive video system operation
  - Overview of new programs
- Interactive video presentation
- Discussion and summary

EPR — Approx. 3.0 Hours

Continue expanded procedures review.

Day No. 2—CMC Simulator Syllabus (LOFT)

Briefing .5 to 1.0 Hours

- General weather briefing
- Performance—Takeoff, enroute, landing
- Flight profile

Simulator

Flight Crew	3.0 to 4.0 Hours
Single pilot	1.5 to 2.0 Hours

LOFT

The simulator training will be conducted as Line Oriented Flight Training (LOFT). The flight profile will include ground and in-flight aircraft malfunctions; however, emphasis will be placed on developing situations which highlight material taken from the Cockpit Management Course syllabus presented prior to the simulator session.

The LOFT will normally include such items as:

- Performance critical takeoff
- ATC procedures and restrictions
- Systems failures
- Anti-ice/deice
- Cold/hot weather procedures
- Instrument approaches
- Complex troubleshooting problems
- Weather problems

With the concurrence of the client, portions of the flight may be recorded utilizing video and voice recorders. At the conclusion of the simulator flight, the crew may self-critique the flight or portions thereof. The instructor will provide his observations on the crews' reactions to course material and crew coordination.

EPR

Continuation of aircraft systems operation and malfunction of sufficient complexity to assure proper analysis and execution of procedures

Debriefing

EMPHASIZE USE OF CHECKLISTS AND COCKPIT MANAGEMENT SKILLS.

Day No. 3—System, Procedures and Enrichment

Training Objective

Complete any items remaining from the systems and procedures review. Provide instruction in pilot enrichment subjects. Complete unfinished areas of PIC check.

Training Completion Standards

- Demonstrate through discussion and quizzing that they understand the basic precepts and operational application of selected enrichment subjects.
- Successfully complete PIC check.

Briefing 3.0 Hours

- Complete any systems and procedures review remaining. Refresh/re-train deficient areas from Day 1 and Day 2.
- Brief/discuss selected enrichment subjects:
  - Windshear
  - Jet upset—wake turbulence
  - Black hole
  - Pilot incapacitation
  - High altitude physiology
  - Ditching
  - Comprehensive hot/cold weather procedures review
  - Regulations—AIM, TERPS review
  - Comprehensive performance review
  - Audio-visual library used as necessary to supplement instruction



Day No. 3—CMC Simulator Syllabus

Briefing .5 Hour

- Training scenario/profile
- Mission/aircraft conditions
- Procedures review

Simulator Flight

Crew	**3.0 to 4.0 Hours**
Single pilot	**1.5 to 2.0 Hours**

- Operational scenario that corresponds to items selected for review, enrichment, and completion of PIC check
- Continued LOFT concept crew decision except instructor involvement during the flight is encouraged

Debriefing



SYSTEMS REVIEW

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SYSTEMS REVIEW

AIRCRAFT GENERAL

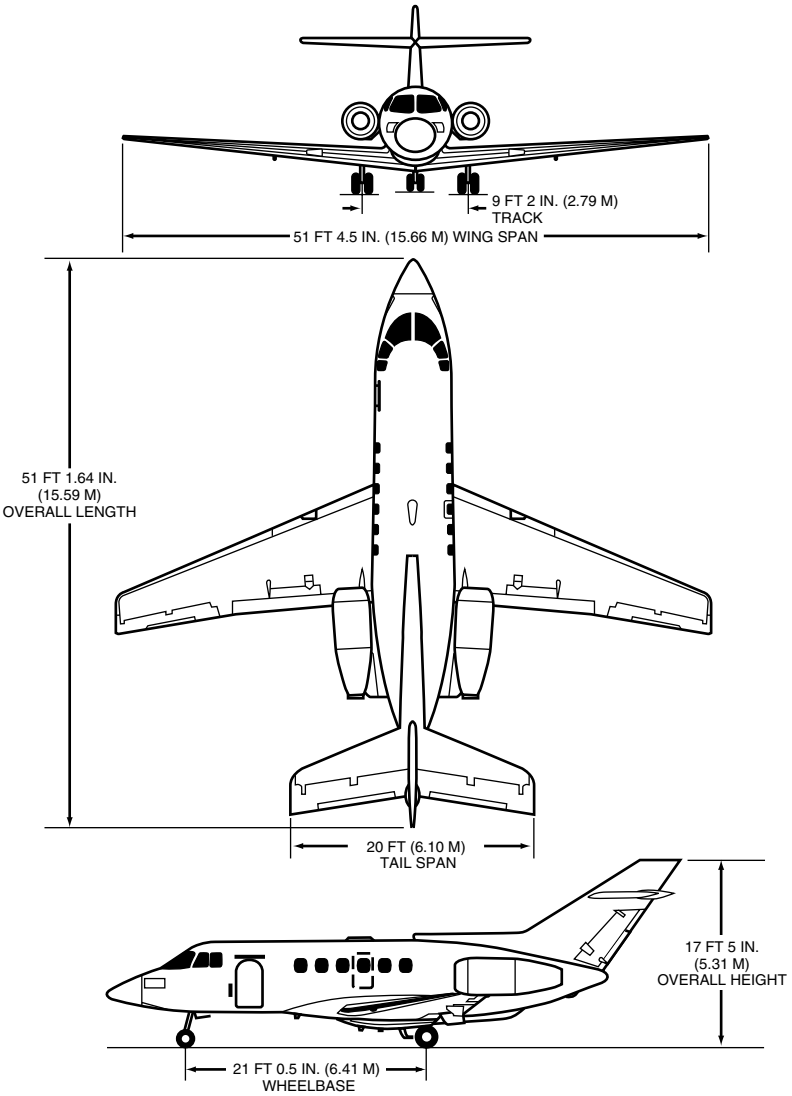


Figure SR-1. Airplane Dimensions

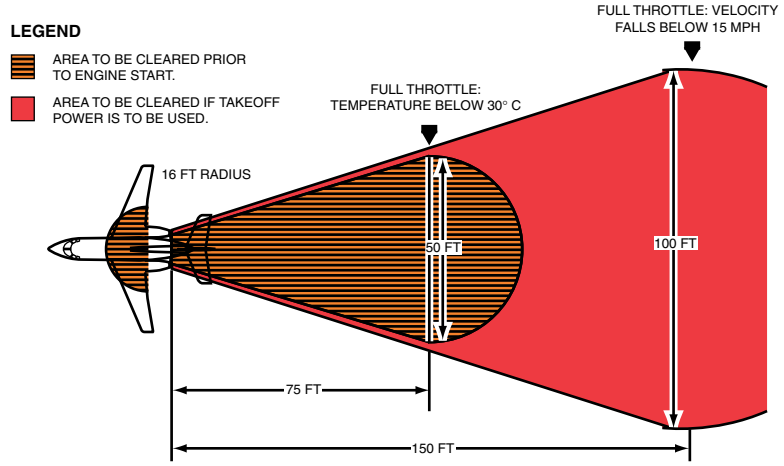

LEGEND
AREA TO BE CLEARED PRIOR TO ENGINE START.
AREA TO BE CLEARED IF TAKEOFF POWER IS TO BE USED.
FULL THROTTLE: VELOCITY FALLS BELOW 15 MPH
FULL THROTTLE: TEMPERATURE BELOW 30° C
16 FT RADIUS
50 FT
100 FT
75 FT
150 FT

Figure SR-2. Danger Zones

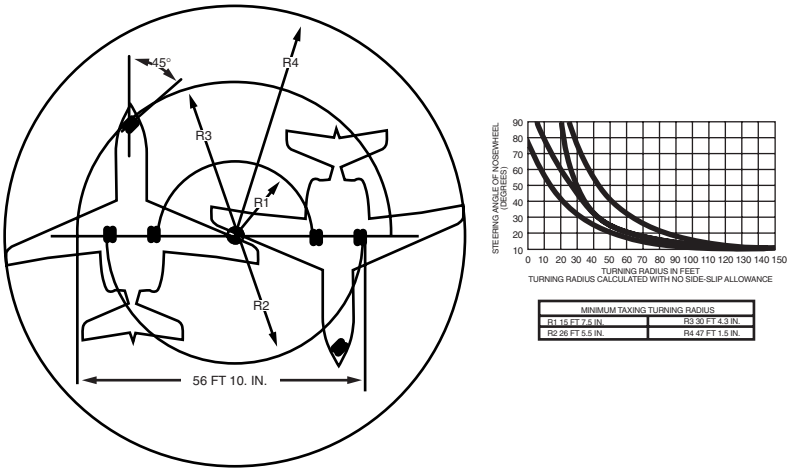

45°
R4
R3
R1
R2
56 FT 10. IN.
STEERING ANGLE OF NOSEWHEEL (DEGREES)
90 80 70 60 50 40 30 20 10
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150
TURNING RADIUS IN FEET
TURNING RADIUS CALCULATED WITH NO SIDE-SLIP ALLOWANCE
MINIMUM TAXING TURNING RADIUS
R1 15 FT 7.5 IN.
R3 30 FT 4.3 IN.
R2 26 FT 5.5 IN.
R4 47 FT 1.5 IN.

Figure SR-3. Minimum Turning Radius

ELECTRICAL SYSTEM

BATTERIES

- No. 1—24 volts, 23 amp-hour nicad or 24 volts, 25 amp-hour lead acid
- No. 2—24 volts, 23 amp-hour nicad or 24 volts, 25 amp-hour lead acid
- No. 3—24 volt, 4 amp-hour nicad
- No. 4—24 volt, 4 amp-hour nicad

GENERATORS

- No. 1—28 volts, 300 amps maximum continuous load
- No. 2—28 volts, 300 amps maximum continuous load
- Garrett APU—28 volts, 300 amps maximum continuous load
- Solar APU:
  - Below ISA +23°C—300 amps
  - Above ISA +23°C—265 amps
- Overvoltage protection—32.5 volts
- Bus-tie protection—24.5 volts to 29.5 volts

INVERTERS

- Standby inverter—250VA, 115 volts, 400 Hz
- Main inverters—1500VA, 115 volts, 400 Hz

ALTERNATORS

- No. 1 and No. 2—7.4KVA, 208 volts, random Hz

DC POWER SYSTEMS

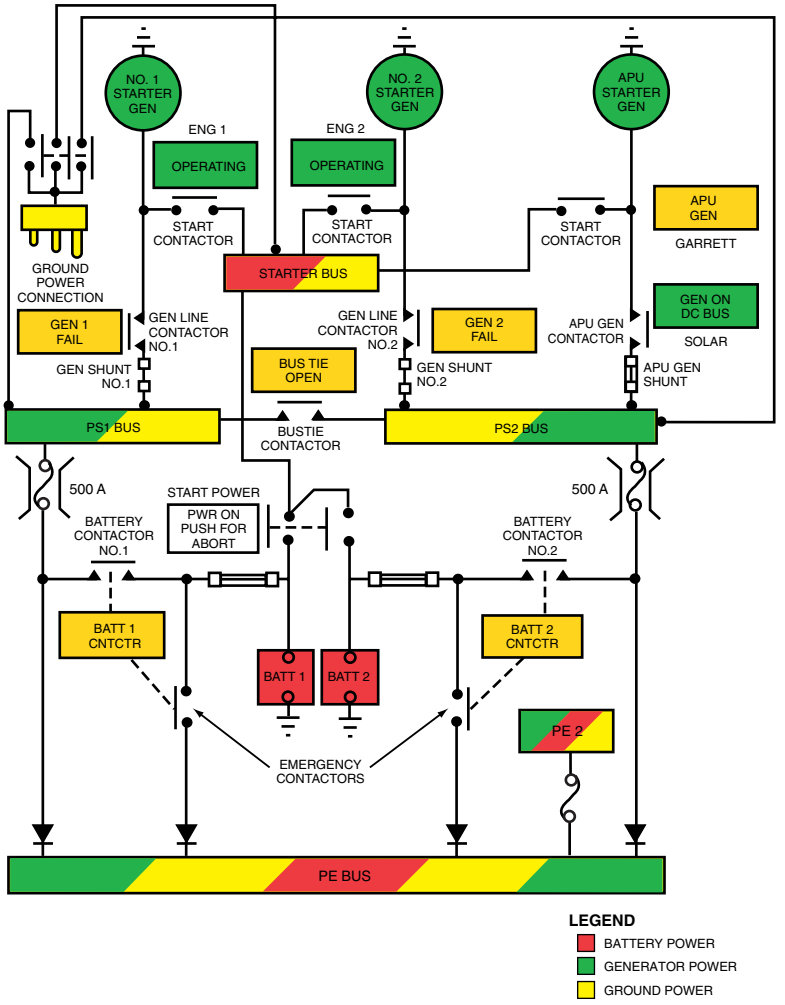


Figure SR-4. DC Power—Bus Power Sources

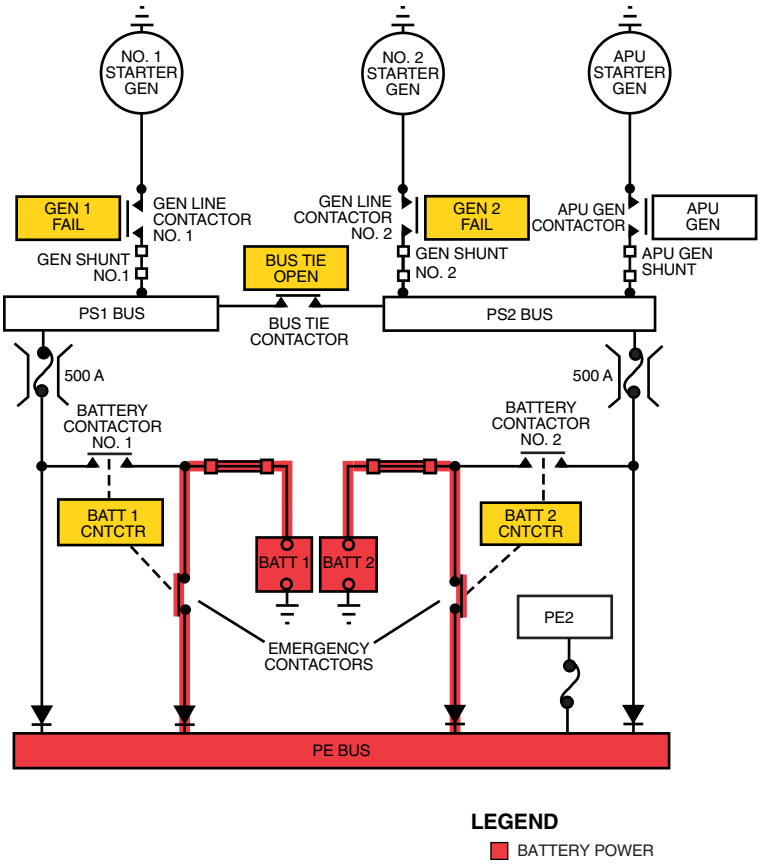


Figure SR-5. Battery Switch—ON or Emergency Position

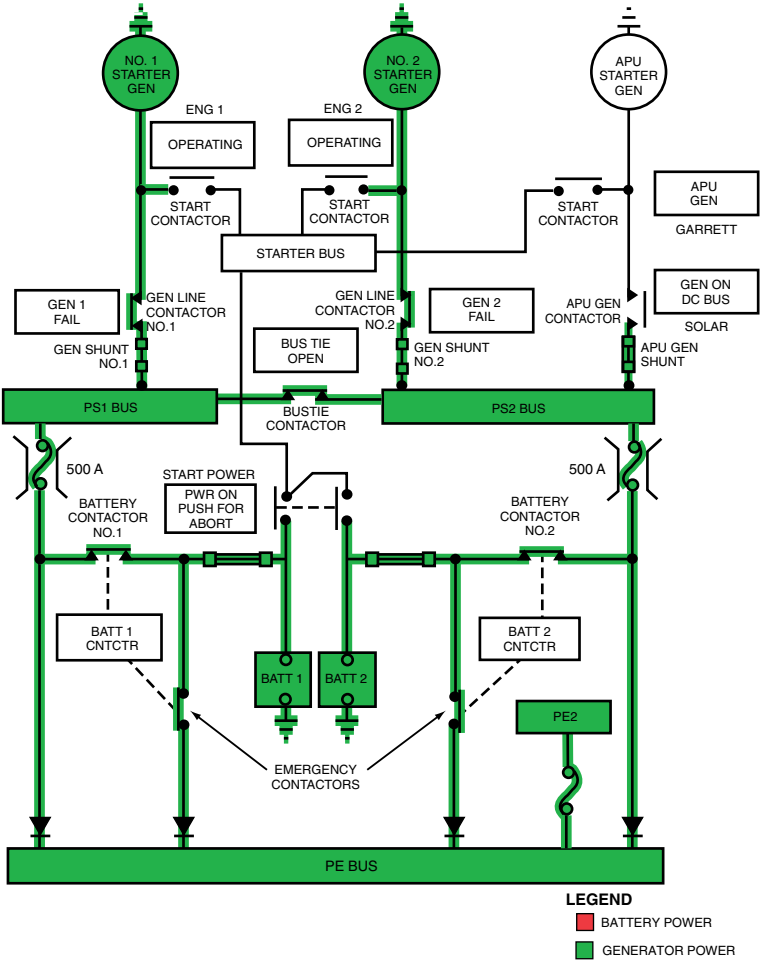


Figure SR-6. Normal Flight Conditions

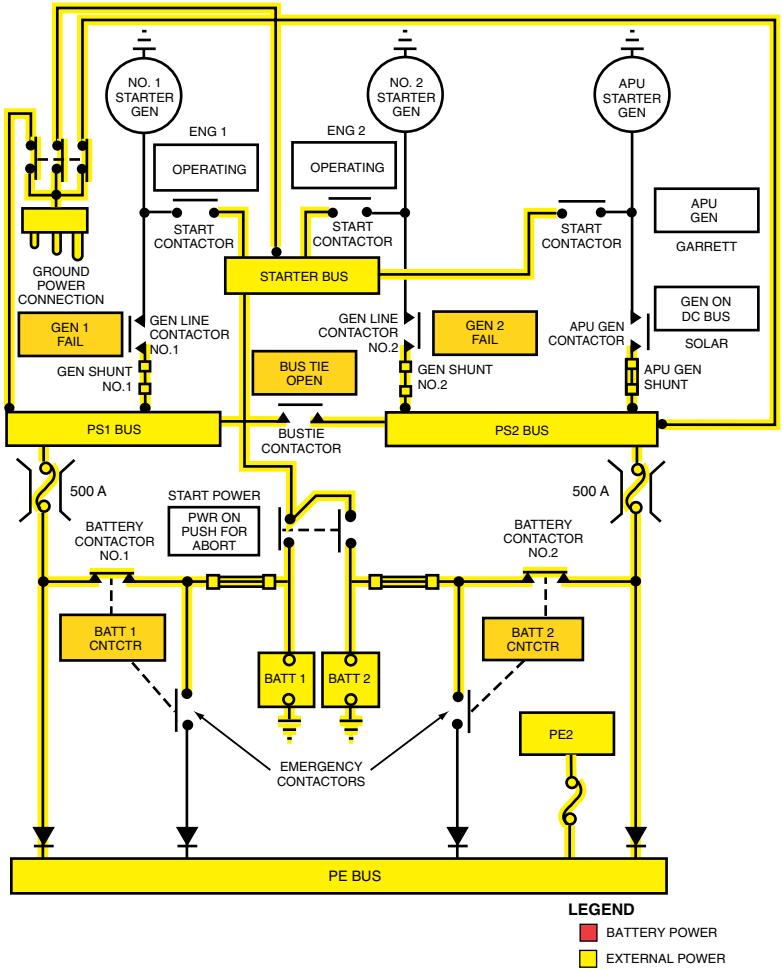


Figure SR-7. GPU Connected

AC POWER

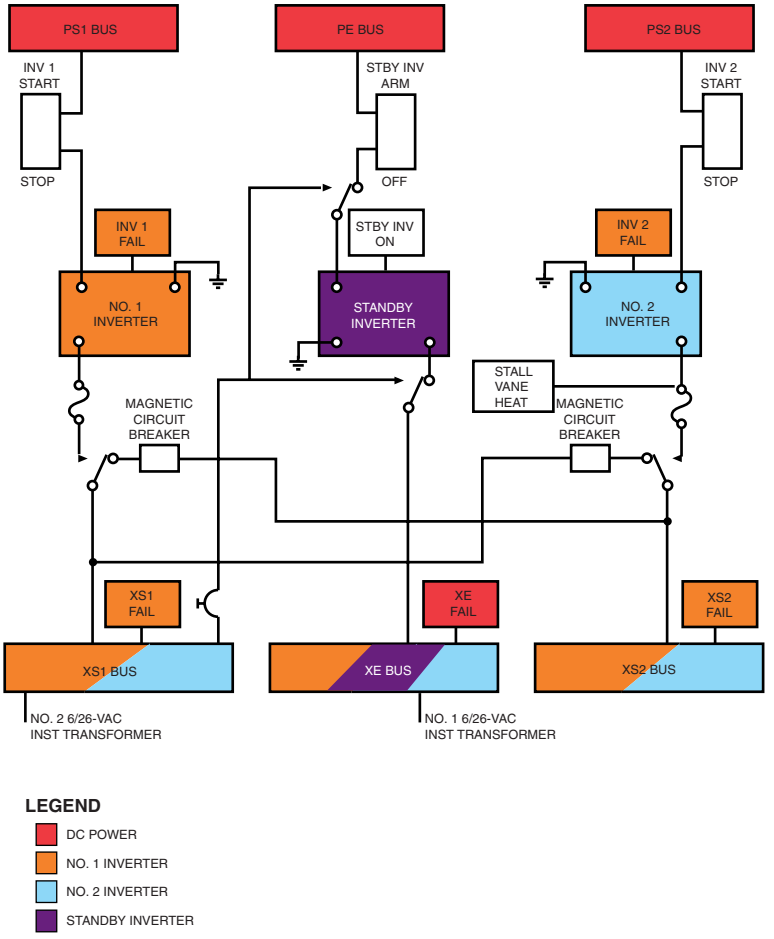


Figure SR-8. AC Power System

FUEL SYSTEM

GENERAL

Approved fuel:

- Jet A
- Jet A1
- Jet B
- JP-4

Minimum fuel temperatures:

- Jet A1 and Jet B ..... –47°C
- Jet A ..... –40°C
- JP-4 ..... –58°C

LIMITATIONS

Fuel Temperature ..... –58 to +57°C
Maximum Refueling Pressure ..... 50 PSI
Maximum Defueling Pressure ..... 11 PSI
Maximum Wing out of Balance (Flight) ..... 500 POUNDS
Wing Tanks ..... EQUALLY DISPOSED
Ventral Tank ..... FULL OR EMPTY

If full, each wing must contain at least 3,450 pounds.

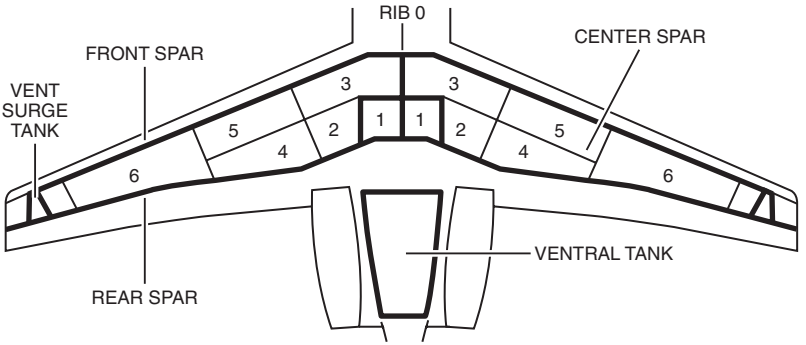
CAPACITIES AND DISTRIBUTION

Table SR-1 lists fuel tank capacities and illustrates tank configuration. Figures SR-9 and SR-11 show fuel distribution and the refueling system, respectively.

Table SR-1. FUEL TANK CAPACITIES

TANK	IMP. GAL.	U.S. GAL.	LITERS	USABLE-LB*	UNUSABLE-LB
Wing left	528	634	2,400	4,224	36
Wing right	528	634	2,400	4,224	36
Ventral	194	233	882	1,552	6
Totals	1,250	1,501	5,682	10,000	78

*Based on a fuel weight of 8.0 lb/Imp. gallon, 6.66 lb/U.S. gallon.



NOTE:
THE NUMBERS 1 THROUGH 6 IDENTIFY COMPARTMENTS WITHIN THE WING FUEL TANKS.

Figure SR-9. Wing Fuel Tank Compartments

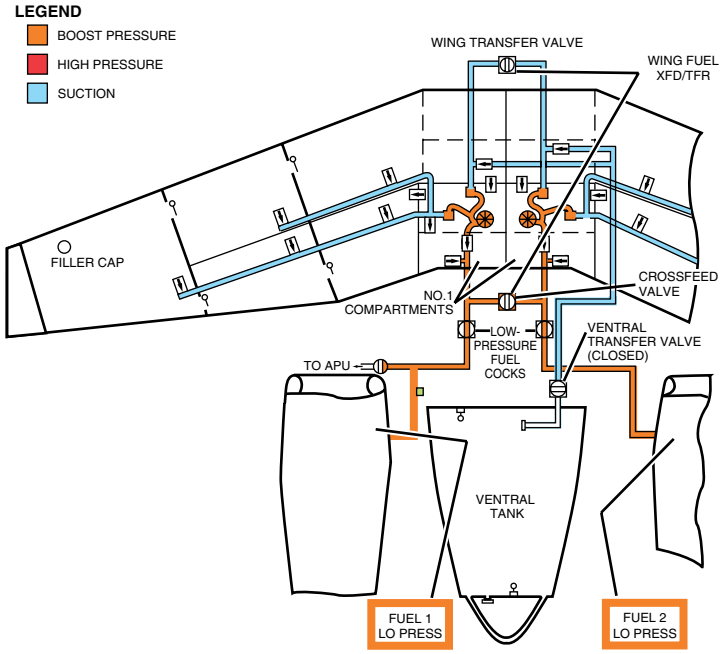


Figure SR-10. Fuel Distribution

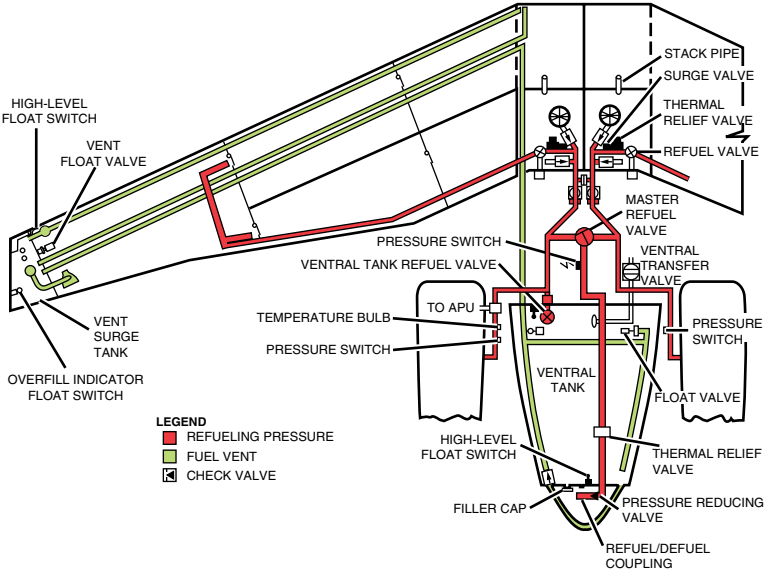


Figure SR-11. Refueling System and Vent Lines

ELECTRICAL POWER

PE BUS BAR

- Left fuel boost pump—Emergency and during engine start
- Right fuel boost pump—Emergency and during engine start

PS1 BUS BAR

- Left fuel boost pump—On
- Left fuel flow/fuel used indicator

PS2 BUS BAR

- Right fuel boost pump—On
- Right fuel flow/fuel used indicator

HYDRAULIC POWER SYSTEM

SPECIFICATIONS

- Fluid, mineral base—MIL-H-5606C; DTD 585B
- Main reservoir capacity—2.4 U.S. gallons (Figure SR-12)
- Auxiliary reservoir capacity—6 U.S. pints
- System pressure—3,000 psi ±100 psi
- System overheat—90°C
- Pressure maintaining valve—2,300 psi
- Full-flow relief valve—Opens at 4,000 psi, closes at 400 psi
- Reservoir pressure regulating valve:
  - Inlet—120 psi
  - Outlet—15 psi
- Reservoir low-air pressure—10 psi
- Reservoir relief valves:
  - Negative relief— –1 psi
  - Positive relief—18 psi

FlightSafety International
HAWKER 800 XP PILOT TRAINING MANUAL

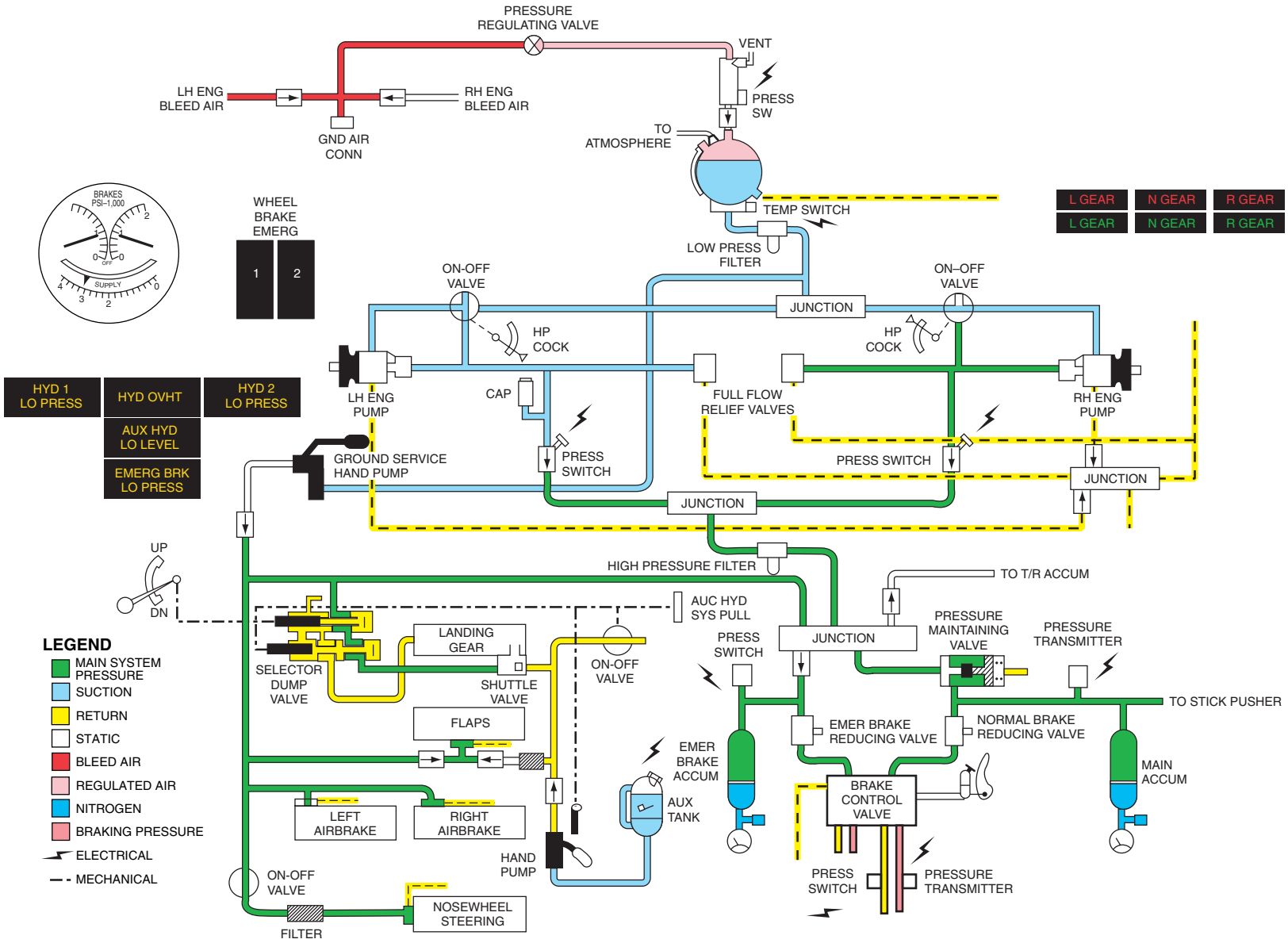


Figure SR-12. Hydraulic System

FOR TRAINING PURPOSES ONLY

MAIN LANDING GEAR

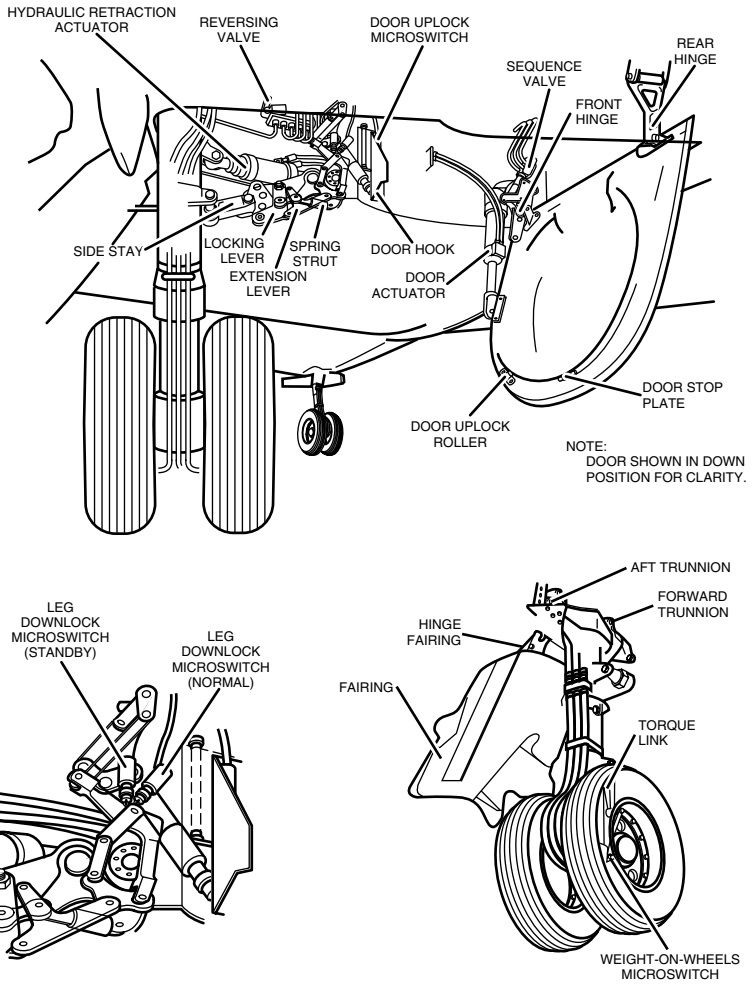


Figure SR-13. Main Gear Components

NOSE GEAR

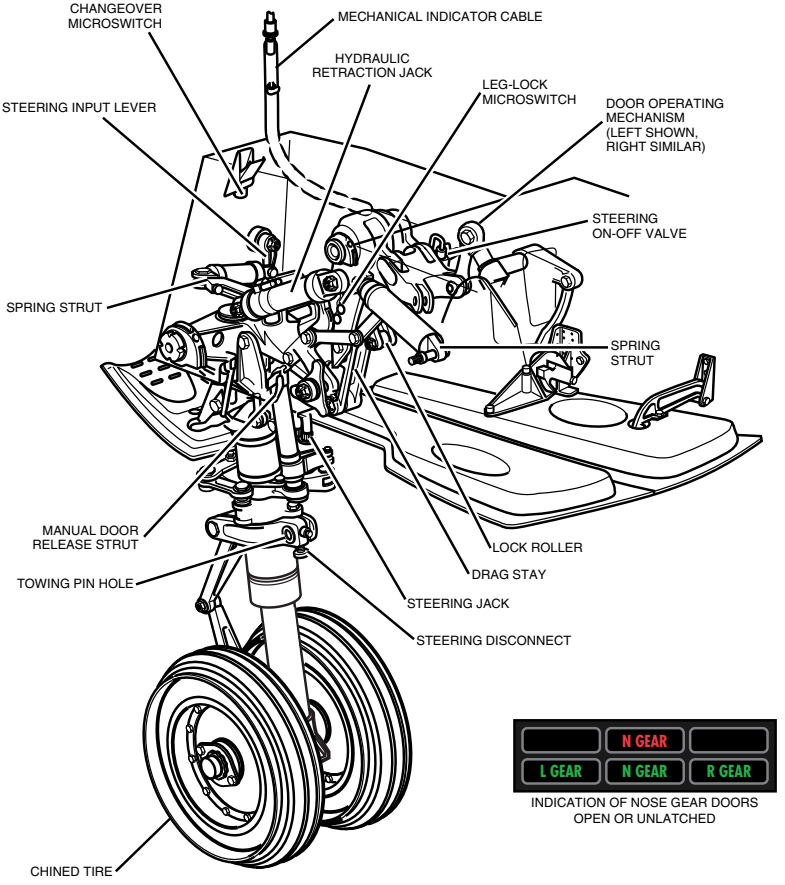


Figure SR-14. Nose Gear Components

NOSEWHEEL STEERING

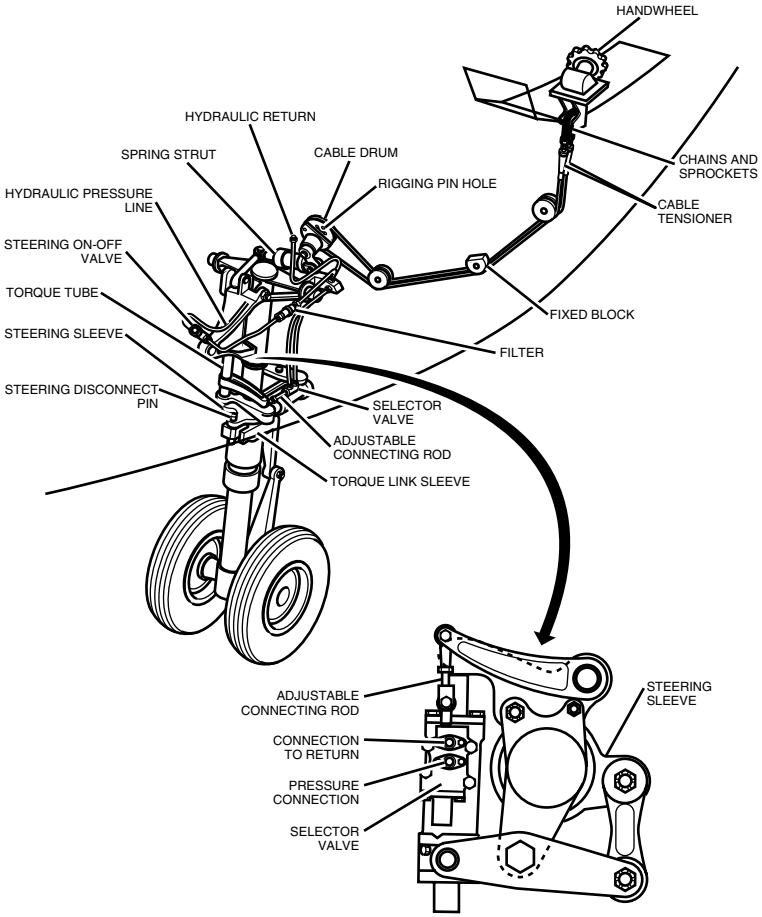


Figure SR-15. Nosewheel Steering System

WHEEL BRAKE SYSTEM—NORMAL

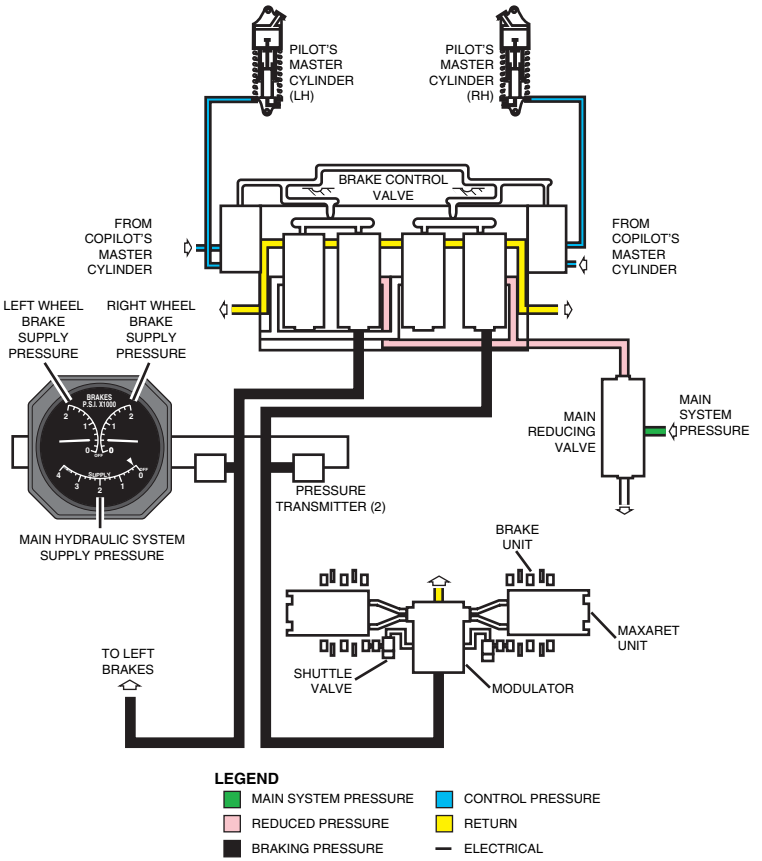


Figure SR-16. Normal Brake System

WHEEL BRAKE SYSTEM—EMERGENCY

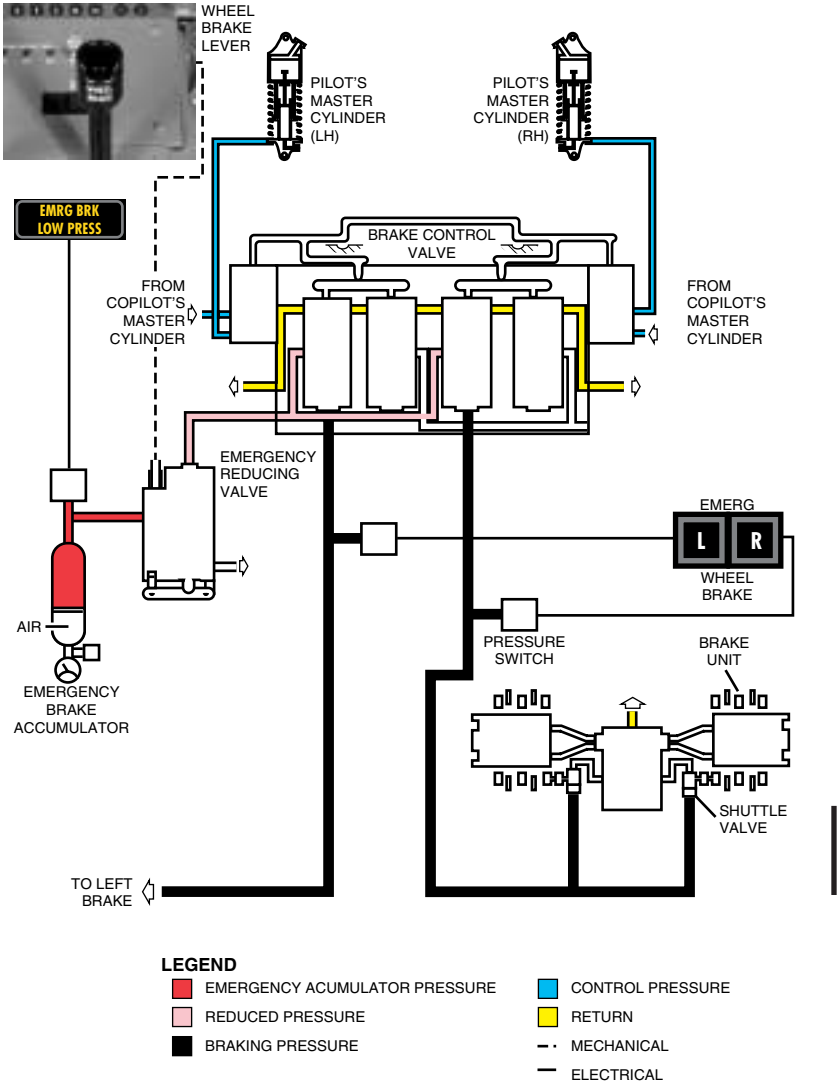


Figure SR-17. Emergency Brake System

WHEEL BRAKE SYSTEM—PARKING

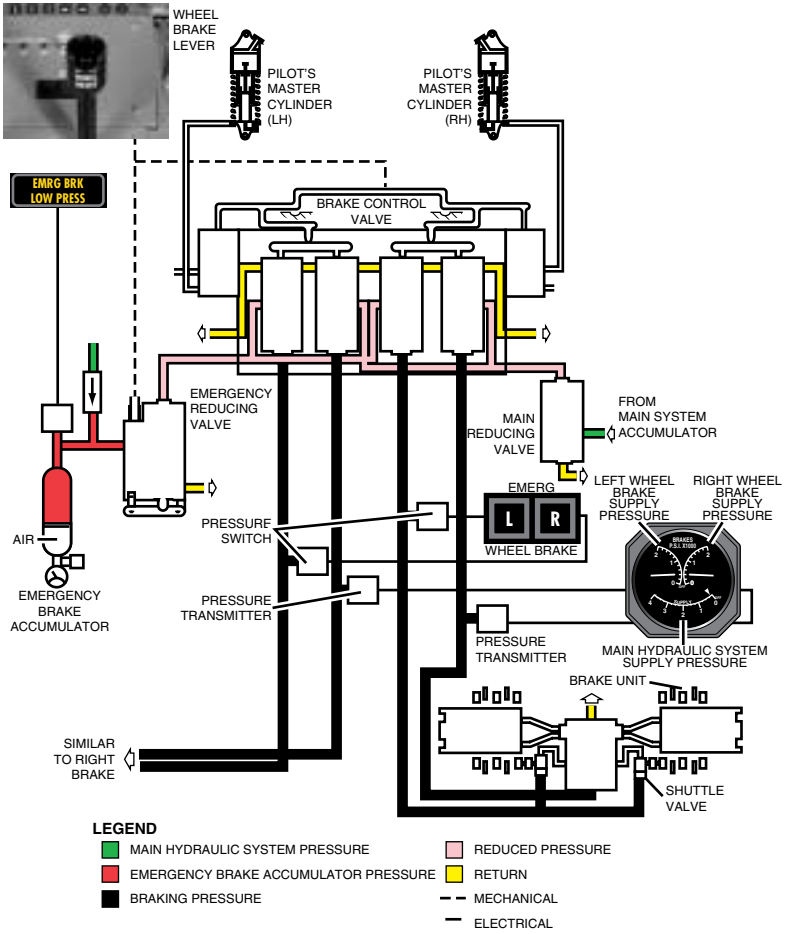


Figure SR-18. Parking Brake System

FLAP SYSTEM

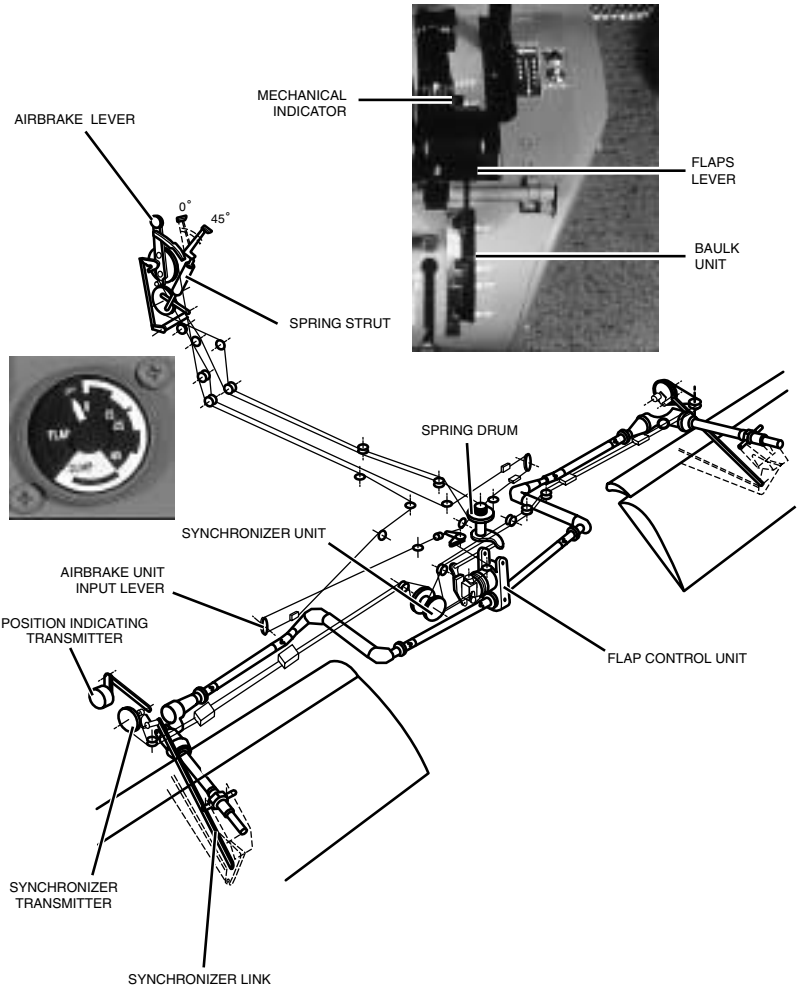


Figure SR-19. Flap Control System

RUDDER BIAS

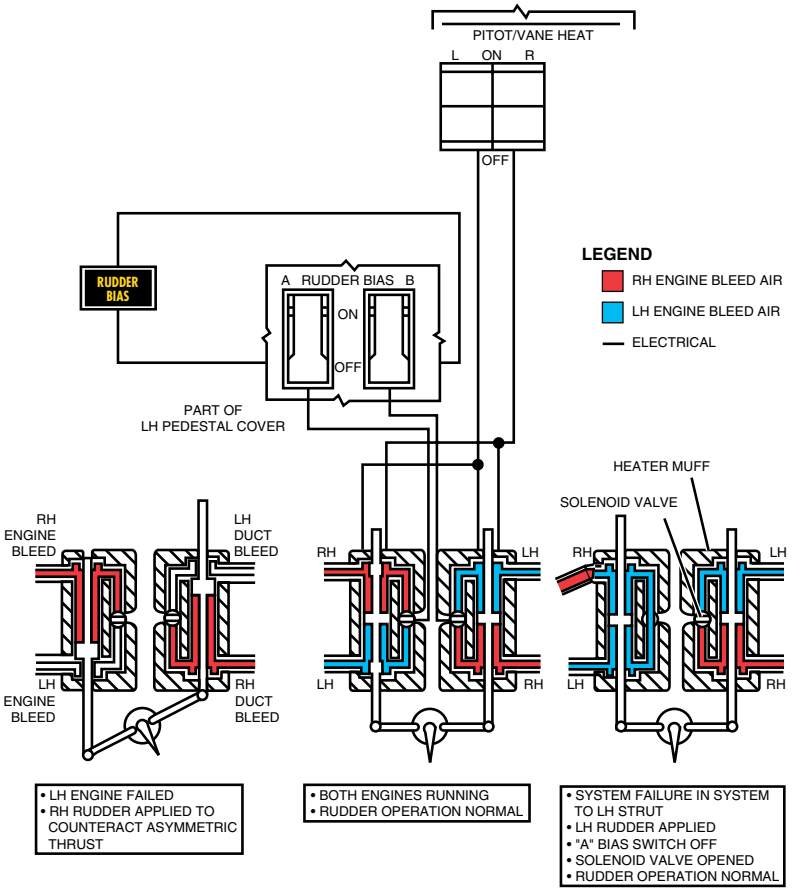


Figure SR-20. Rudder Bias System

FLIGHT CONTROLS

STALL WARNING AND IDENTIFICATION SYSTEM

The stall warning and identification system provides both visual and mechanical warnings of approach to stall. The triggering of these warnings is initiated by two signal summing units (SSU), which receive inputs from two airflow angle sensors (stall vanes), flap position switches, and weight-on-wheels (squat) switches. A press-to-test facility, effective on the ground only, is also provided.

The airflow angle sensor vanes are highly balanced and sensitive to local air movement. With the aircraft on the ground, whether static or mobile, this local air movement may be erratic; therefore, the related airflow angle sensor signals are unusable. The system (signal summing unit arming) is inhibited by weight-on-wheels-controlled relays. On airplane lift-off, the warning system (stick shaker) is automatically armed and ready to operate; the identification system (pusher) is armed six seconds later.

The airflow angle sensors are mounted below the fuselage horizontal datum between frames 5 and 6 and are not responsive to flap position. Therefore, wing angle of attack is determined within a signal summing unit by combining the airflow angle sensor signals with signals derived from flap position microswitches. As the wing incidence increases, the first stall warning level is reached, and the stick shaker motors mounted on the control columns are energized. The second identification warning level is attained if wing incidence is further increased, although the actual angle at which triggering occurs is reduced proportionately when airflow angle sensors vane angles increase at rates exceeding 2° per second.

Stick pusher identification warning induces a nosedown pitching movement through extension of a hydraulic jack associated with the elevator controls and illumination of the STALL VLV A and B OPEN lights. Extension of the jack is only possible with energization of two solenoid-operated valves, each separately controlled by a warning signal from one signal summing unit together with an identification signal from the other signal summing unit.

A third channel, controlled by a stall detector, senses right side pitot, forward plate static, and wing vent pressures; this channel provides backup for the normal signal summing units controls by linking together the two solenoid valve control circuits when wing incidence, as determined by the detector, is above the warning level but below the identification level.

Disengagement of the autopilot and isolation of the ground proximity system (if installed) occurs at initiation of stick-shaker operation.

In the event of a double generator failure, the IDNT 3 light illuminates when a stall condition is sensed.

FAULT ANALYSIS

Stick shaker operation resulting from a single warning channel fault may be cancelled by tripping the relevant circuit breakers.

IDNT 1, 2, or 3 light illumination indicates an identification channel fault. Inhibition of the fault is accomplished by pressing either the left or the right annunciator, which illuminates the INHIB light. Fault IDNT lights are accompanied by MWS STALL IDENT annunciation.

Complete inhibiting of the identification function is accomplished by pressing both IDNT 1 and 2 annunciators simultaneously.

FLAP fault light indicates an asymmetry for more than two seconds of left and right flap position relays, and the MWS STALL IDENT annunciator illuminates.

SQUAT fault light indicates an asymmetry for more than four seconds of left and right weight-on-wheels relays; the MWS STALL IDENT annunciator illuminates.

SSU fault light indicates that a signal summing unit fault exists; the MWS STALL IDENT annunciator illuminates:

- Loss of 115-volt supply
- Loss of internal power or short circuit
- Loss of airflow angle sensor excitation
- Loss of flap position input
- Airflow angle sensor transformer winding open circuit
- Airflow angle sensor transformer winding short circuit

L or R VANE HTR FAIL light indicates loss of left or right airflow angle vane heating; the MWS ICE PROT ↑ annunciator also illuminates.

Stall vane heater power supplies:

- With both windshield alternators operating
- Left alternator powers the left stall vane
- Right alternator powers the right stall vane
- With one alternator inoperative, the left and right stall vanes are powered by the No. 2 inverter with both inverters operating
- With one alternator and one inverter inoperative, the stall valves are not heated

Airflow angle sensors' power supply is from the XS1 and XS2 bus bar, 115 volts, 400 Hz.

Table SR-2. STALL WARNING SYSTEM ANNUNCIATORS

PILOT

ANNUNCIATOR	CAUSE FOR ILLUMINATION
STALL VLV A OPEN	Stick-pusher operation
STALL VLV B OPEN	
IDNT 1	Channel fault
INHIB 1	Channel inhibited
IDNT 2	Channel fault
INHIB 2	Channel inhibited
SSU	SSU fault
FLAP	Asymmetry (longer than 2 seconds)
IDNT 3	Channel fault
INHIB 3	Channel inhibited

COPILOT

ANNUNCIATOR	CAUSE FOR ILLUMINATION
STALL VLV A OPEN	Stick-pusher operation
STALL VLV B OPEN	
IDNT 1	Channel fault
INHIB 1	Channel inhibited
IDNT 2	Channel fault
INHIB 2	Channel inhibited
SQUAT	Left, right squat switch asymmetry (longer than 4 seconds)
HYD	Pusher accum low pressure
IDNT 3	Channel fault
INHIB 3	Channel inhibited

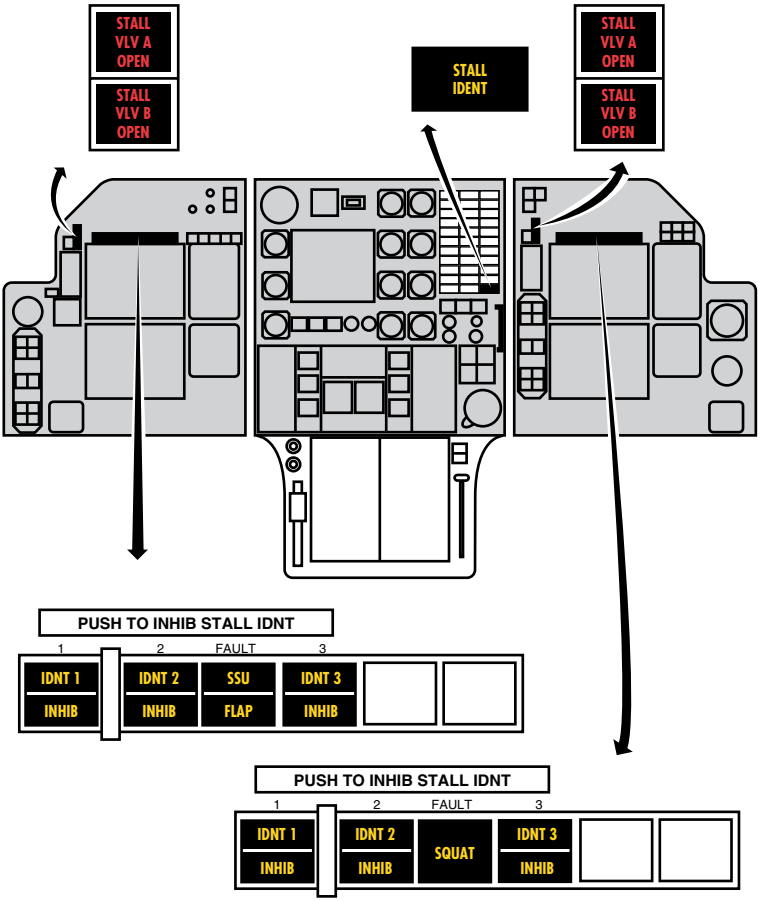


Figure SR-21. Stall Warning and Identification System—Controls and Annunciations

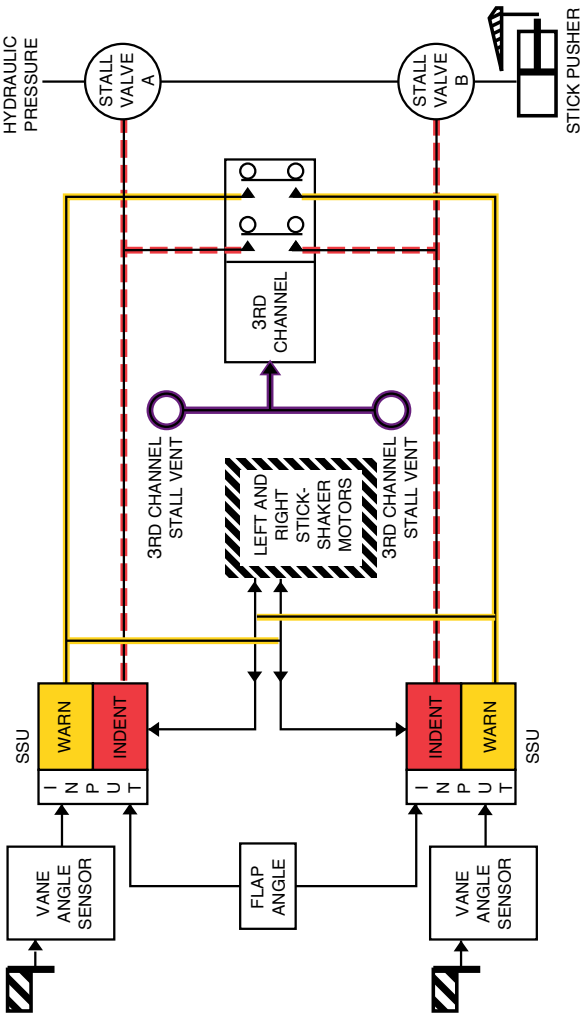


Figure SR-22. Stall Warning and Identification System Schematic

POWERPLANT

GENERAL

The TFE731-5BR-1H engine specifications are as follows (Figure SR-23):

- Thrust..... 4,660 POUNDS AT SEA LEVEL AND 73°F (4,810 POUNDS WITH APR)
- Bypass Ratio..... 3:47:1
- Specific Fuel Consumption ..... 0.484 POUNDS AT SEA LEVEL
- N_1 at 100% ..... 21,000 RPM
- N_2 at 100% ..... 30,300 RPM
- Fan at 100% ..... 10,667 RPM

COMPONENTS DESCRIPTION

Planetary Gear Assembly

The planetary gear assembly (Figure SR-23) located immediately aft of the fan interconnects the fan to the low-pressure (LP) turbine and provides the necessary gear reduction ratio (1.8 to 1), as well as producing the counter-clockwise rotation of the fan.

Low-Pressure (LP) Compressor

The LP compressor consists of four axial compressor stages The inner diameter of the fan supplies a mass of air to the LP compressor, which, by a diffusion process, progressively increases the pressure of the air mass and accelerates it rearward through a diffuser duct. The LP compressor is driven by the LP turbine. The direction of rotation is clockwise.

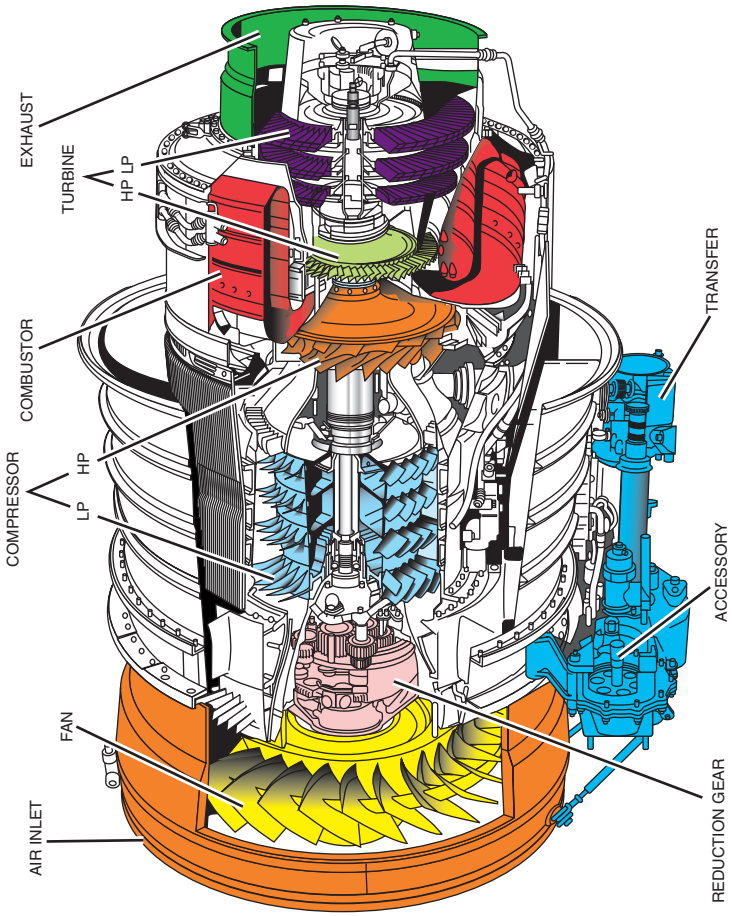


Figure SR-23. Engine Cutaway

High-Pressure (HP) Compressor

The HP compressor is a single-stage centrifugal compressor. The function of the HP compressor is to further increase the air pressure (by acceleration and diffusion) supplied to it by the LP compressor and direct the air mass rearward through a diffuser duct to the combustor.

The HP compressor is driven by the HP turbine, and it rotates in a clockwise direction.

Combustor

The combustor consists of a reverse-flow combustion chamber located aft of the HP compressor and surrounding the turbine section. The combustion chamber includes 12 equally spaced fuel atomizers or spray nozzles and two high-energy igniter plugs. The function of the combustion chamber is to control the mixing of fuel and air and, following ignition of this mixture by two igniter plugs, contain the combustion gases and direct them for expansion through the turbine section.

As a reverse-flow combustor, the air mass for the compressor enters the combustion chamber at the aft end by making a 180° turn and flows forward through the combustion chamber. The combustion gases are again turned 180° and flow aft to the turbine. Two annular skin sections surrounding the combustion section form a passage for a portion of the fan bypass air to provide additional cooling for the hot section. This cooling airflow reenters the bypass air duct.

High-Pressure (HP) Turbine

The single-stage, axial-flow HP turbine is rigidly connected to the HP compressor by the high-pressure rotor shaft. The HP turbine extracts sufficient energy from the hot gases to drive the HP compressor and the accessory gear assembly.

The HP turbine and the HP compressor rotating the assemblies constitute the HP spool. The direction of rotation is clockwise. The rpm of the HP rotating group is designated N_2.

Low-Pressure (LP) Turbine

The three-stage LP turbine is rigidly connected to the four-stage LP compressor by the LP rotor shaft. This shaft is coaxially located within the HP rotor shaft. The direction of rotation is clockwise.

The LP turbine discs progressively increase in diameter from front to rear. Therefore, each disc extracts an equal amount of energy from the combustion gases, which is sufficient to drive the four-stage LP compressor and the single-stage fan through the planetary gear system.

The LP turbine, the LP compressor, and the fan form the LP spool of the engine. The rpm of the LP spool is designated N_1.

Exhaust

The exhaust consists of the primary (engine core) exhaust duct and the bypass air duct. The function of the exhaust is to route the gases to the atmosphere and provide the direct thrust for the airplane.

OIL SYSTEM

Approved oil for use in the –5BR engine include:

- Mobil 254 (Type III)

Total oil capacity of the system:

- U.S. Pints—25
- Imperial Pints—22
- Liters—12.5

Total capacity of tank:

- U.S. Pints—13.2
- Imperial Pints—11.7
- Liters—6.24

NOTE

A card listing approved oil is located in the airplane manual stowage. The consumable quantity stated on the card refers to the oil available for use below the MIN level on the sight glass and is sufficient for more than 12 hours engine operation at maximum oil consumption.

ENGINE ANTI-ICING

Switching the engine anti-ice system on momentarily illuminates the ENG 1 or 2 A/ICE annunciator at a dimmed level. If air does not become available within two seconds, the annunciator becomes brighter. Either engine anti-ice switch selected on causes an increase of approximately 7% N_1 rpm on both engines with power levers at idle. This feature is inhibited on the ground.

ELECTRICAL POWER SOURCES

PE Bus Bar

- APR/Sync Computer
- Computer—AUTO 1 and 2
- Computer—OVSPD PROT 1 and 2
- ENG FUEL Warning 1 and 2
- HP Cocks Warning via Fire Detection System
- Oil Pressure Indicators 1 and 2
- Oil Temperature Indicators 1 and 2
- OIL LO PRESS Annunciators 1 and 2

PS1 Bus Bar

- No. 1 N_1 rpm Indicator*
- No. 2 N_2 rpm Indicator*
- No. 2 ITT Indicator*

*PE during internal engine start

LIMITATIONS

LP Rotor RPM (N_1)

Takeoff 100%

Maximum Continuous 100%

Overspeed (Five Seconds) 103%

HP Rotor Speed (N_2)

Takeoff (Normal) 100%

Takeoff (APR Operating Five Minutes) 100.8%

Maximum Continuous 100%

Overspeed (Five Seconds) 103%

Intertubine Temperature (ITT)

Table SR-3 outlines engine operating conditions, relating to rpm, ITT, and time limit parameters.

Oil Temperature

SL to 30,000 Feet (Maximum) ..... 127°C

30,000 Feet and Above (Maximum) ..... 140°C

Transient (Maximum) (Two Minutes) ..... 149°C

Starting (Minimum) ..... –40°C

Power Above Idle (Minimum) ..... +30°C

Minimum oil temperature (for fuel filter deicing) (°C):

• Oil Temperature	+30	+40	+62	+83
• Fuel Temperature	–15	–20	–30	–40

Oil Pressure

Takeoff-climb and maximum continuous ..... 38 to 46 PSI

Transient (Three Minutes Maximum) ..... 55 PSI

Idle (No Limit) ..... 25 PSI

Fuel

Temperature (Maximum) ..... +57°C

Table SR-3. ENGINE OPERATING CONDITIONS

CONDITION	% RPM N_1	% RPM N_2	MAX ITT °C	TIME LIMIT
Starting and relighting	–	–	978°C	Unlimited time
	–	–	996°C	10 seconds
		Over	996°C	5 seconds
			1,037°C	*
Normal takeoff (5 minutes)	100	100	978°C	5 minutes
Maximum (APR) takeoff, (5 minutes)	100	100.8	996°C	5 minutes
Maximum continuous	100	100	968°C	Unrestricted time; this is not a normal cruise setting.
Maximum overspeed	103	103	–	5 seconds
Maximum cruise	100	100	932°C	
Operating transients	–	–	1,006°C	5 seconds
	–	–	1,016°C	2 seconds
			**	
			***	

NOTE:

* If achieved or exceeded: record maximum temperature and duration in engine log. Hot section inspection must be carried out before further engine operation.

** 1,007° to 1,016°C for more than two seconds, or

*** 1,017°C attained or exceeded: enter maximum temperature and duration in engine log. Hot section inspection must be carried out before further engine operation.

POWERPLANT—COMPUTER

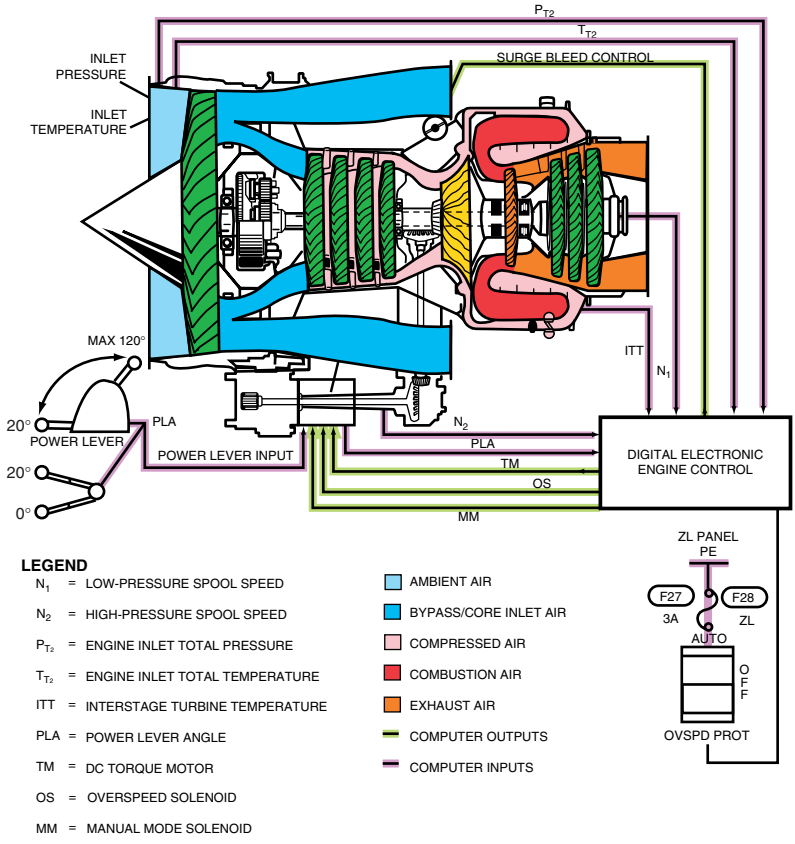


Figure SR-24. Fuel Computer—Engine Interface

POWERPLANT—SYNC

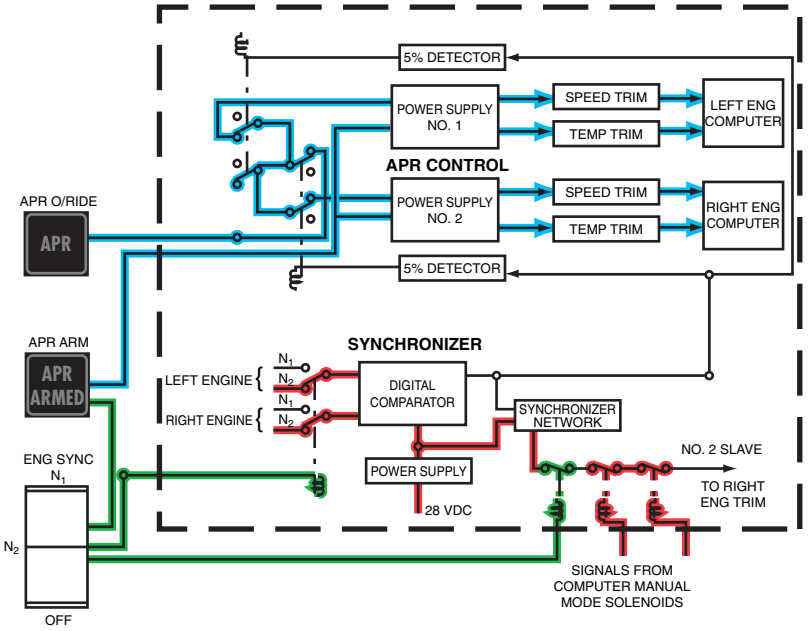


Figure SR-25. APR—OFF SYNC—N_2

POWERPLANT—APR ARMED

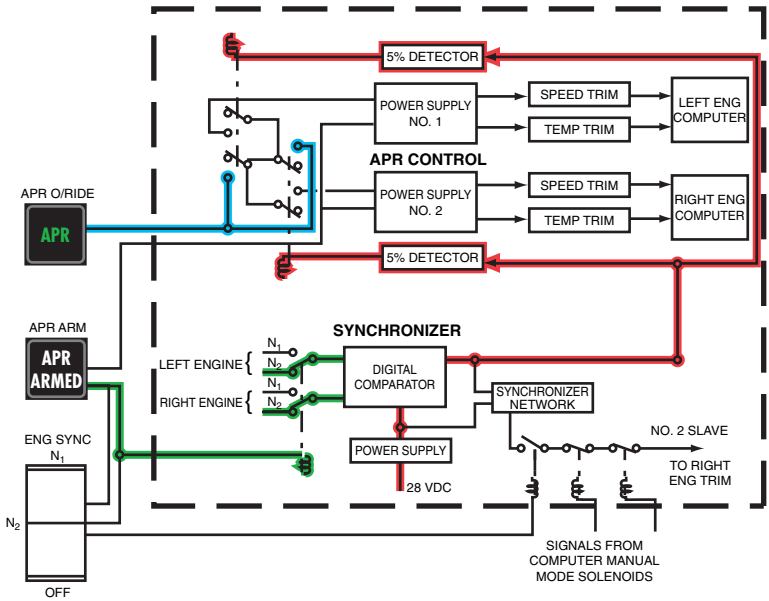


Figure SR-26. APR—ARMED 5% N_2 SENSED

POWERPLANT—OIL

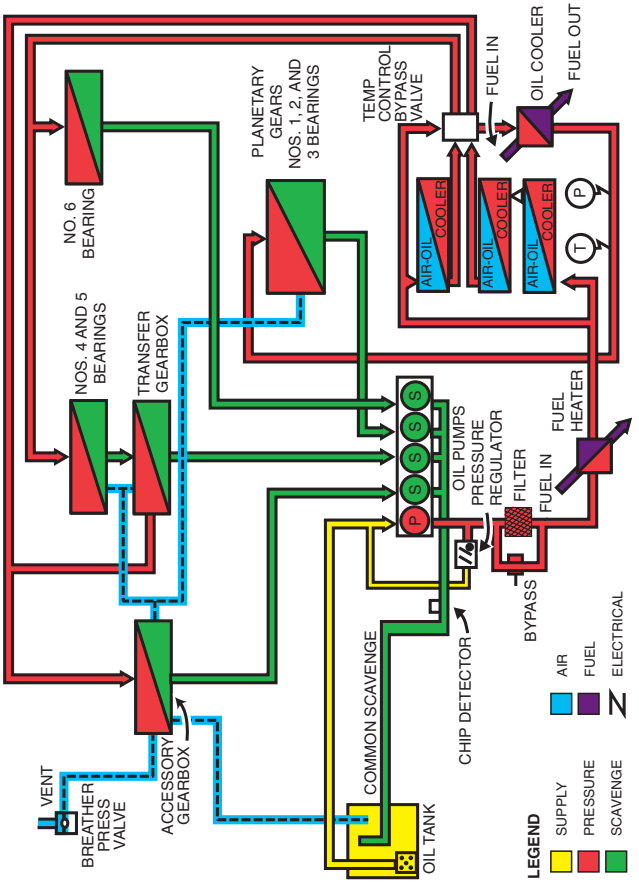


Figure SR-27. Oil System

POWERPLANT—FUEL

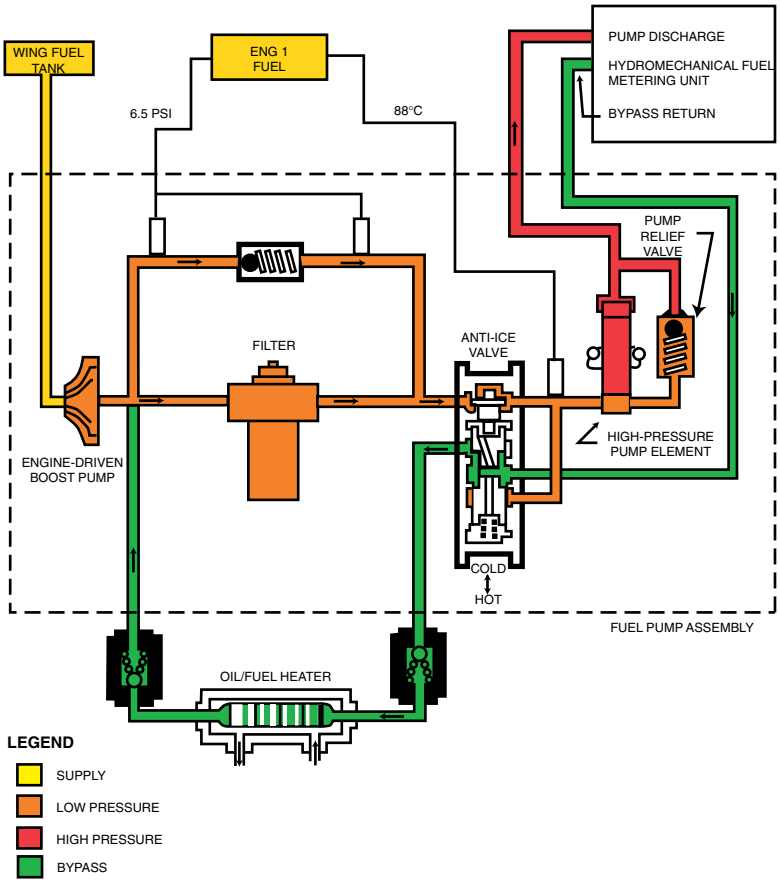


Figure SR-28. Fuel System

POWERPLANT—THRUST REVERSER SYSTEM

General

The Hawker 800 airplanes may be equipped with an optional Dee Howard TR5000BA thrust reverser system. The system includes a thrust reverser assembly at the rear of each engine nacelle and various controls and indicators located within the cockpit.

Thrust Reverser Assembly

Each thrust reverser assembly is an electromechanically controlled, hydraulically operated, target-type thrust reverser consisting of the following components:

- Upper and lower clamshell doors, located on the rear of each engine nacelle
- Hydraulic actuators and associated linkages that position the reverser doors upon either stow or deploy commands
- Latches, which hold the reverser doors in the stowed position until released by sequentially actuated switches and relays
- Fan flaps within each fan duct, which, in reverser mode, aid in temperature reduction on the doors. They deploy and stow in conjunction with the doors.

Controls and Indicators

An electrical control panel, located on the lower section of the center instrument panel (Figure SR-29), contains L/H and R/H THRUST REVERSER POWER switchlights which illuminate ARM or OFF. Amber UNLCK and green REVRS lights are also included for each assembly and are found on this panel.

Thrust reverser levers are mounted piggyback on the normal throttles (Figure SR-30). Each lever provides control for stow, deploy, and modulation of reverse thrust from reverse idle to maximum reverse thrust for its respective engine. Each throttle has a solenoid-operated throttle balk (lockout) that mechanically prevents selection of reverse thrust until the reversers are fully deployed. There is a stop on each throttle to mechanically limit the obtainable reverse thrust when the thrust reverser lever is increased to its maximum thrust position. An automatic throttle retard system is incorporated in the event of a stow or deploy malfunction.

An amber REVERSER annunciator, located as the top light on the center column of the MWS panel (Figure SR-29), indicates the existence of a malfunction of either reverser.

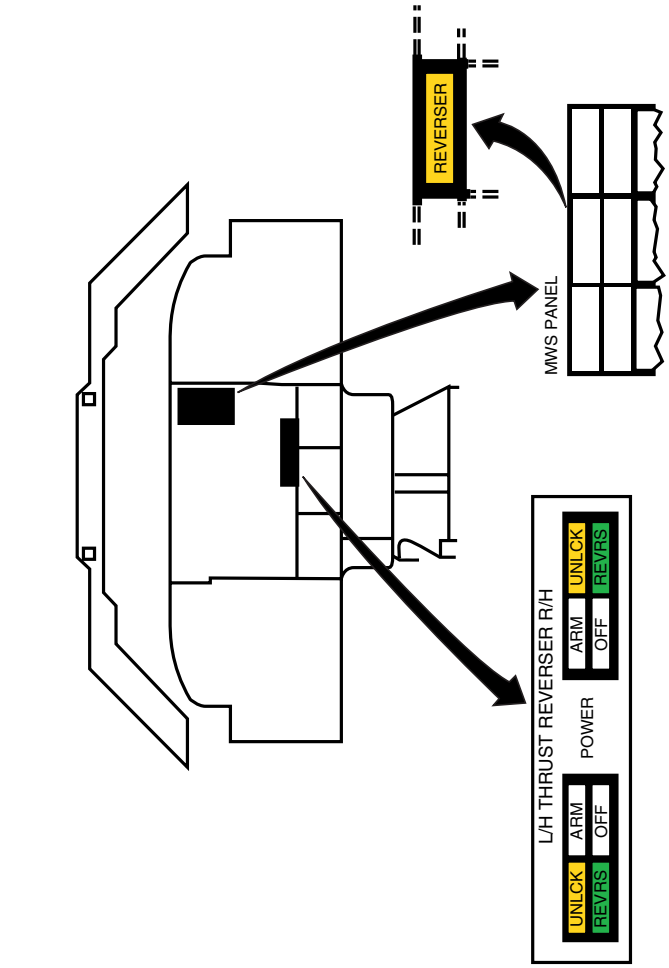
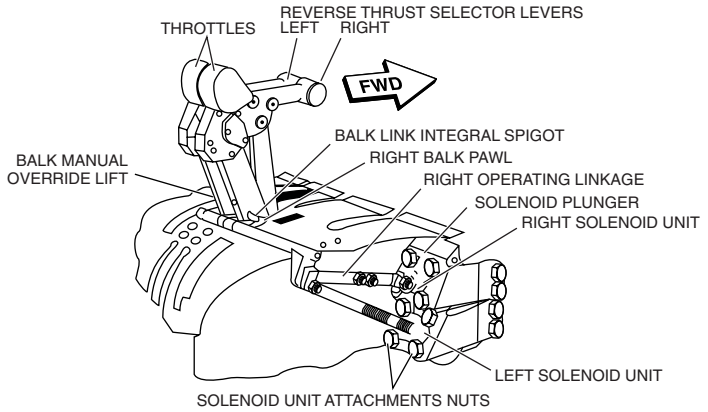
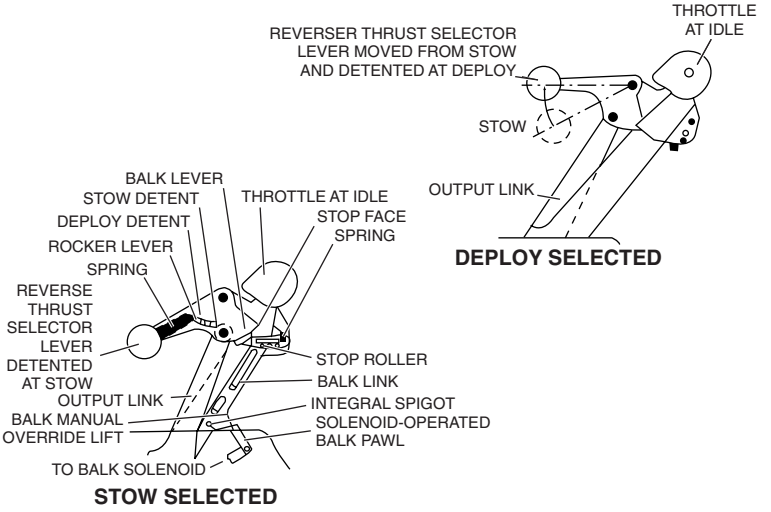


Figure SR-29. Thrust Reverser Control Panel and MWS Panel







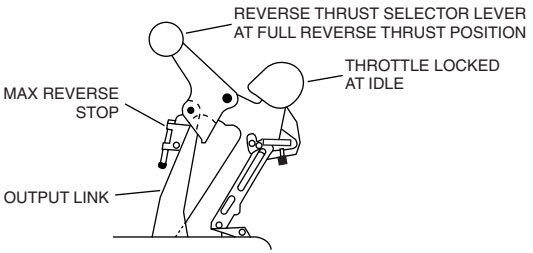


Figure SR-30. Thrust Reverser Throttle Controls

System Operation

Figures SR-31 through SR-36 show the thrust reverser system in various configurations.

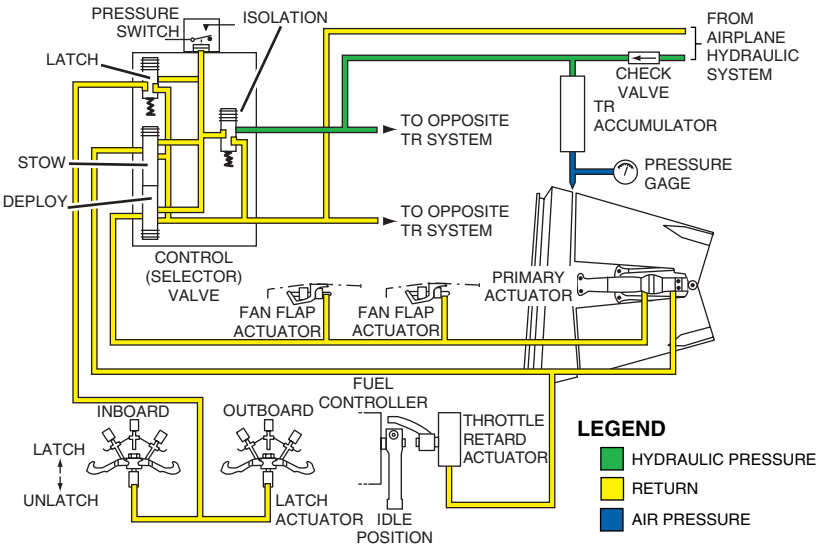


Figure SR-31. Thrust Reverser System—Deenergized

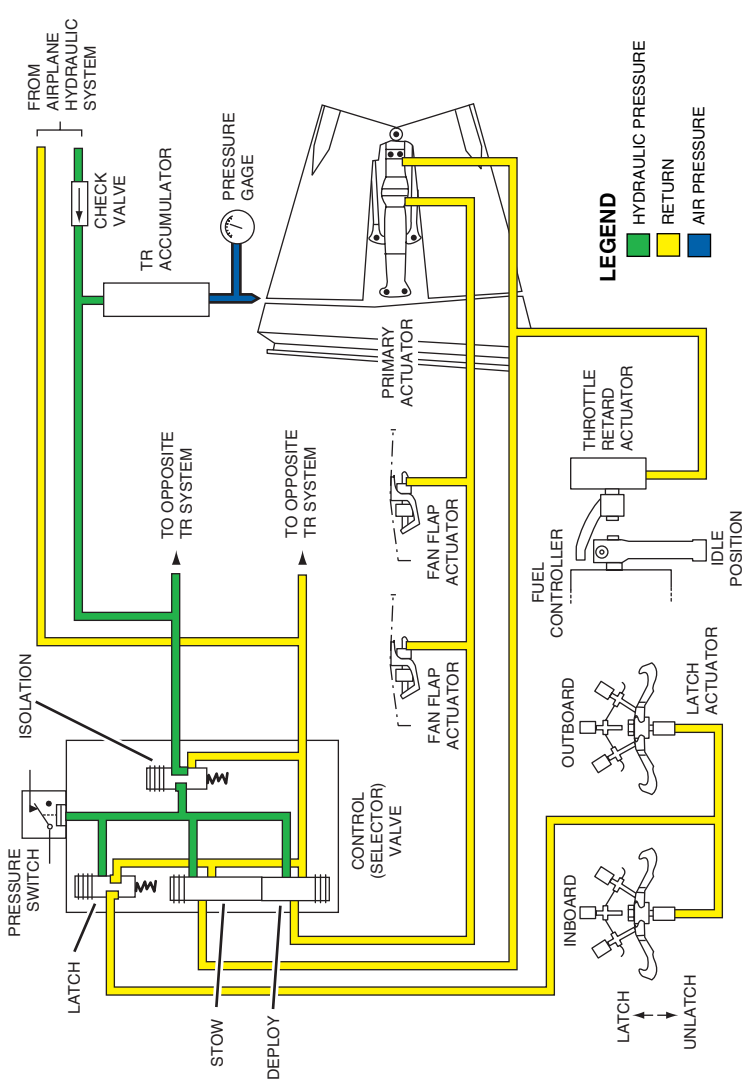


Figure SR-32. Thrust Reverser System—Armed

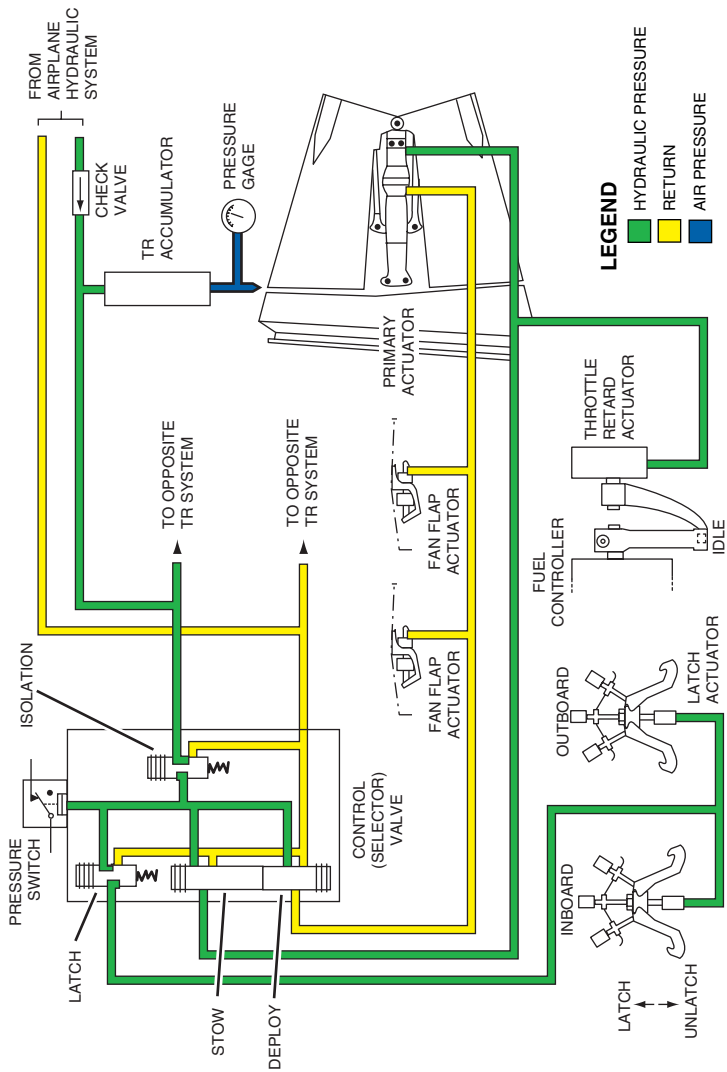


Figure SR-33. Thrust Reverser System—Overstow and Unlatch

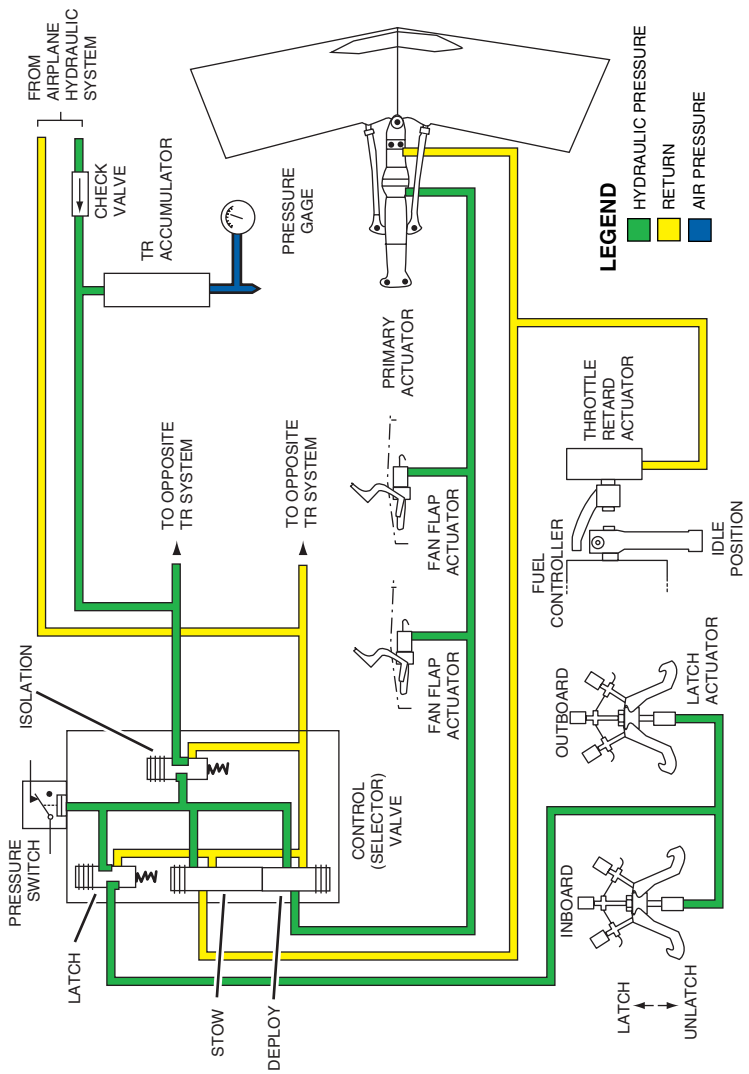


Figure SR-34. Thrust Reverser System—Deploy

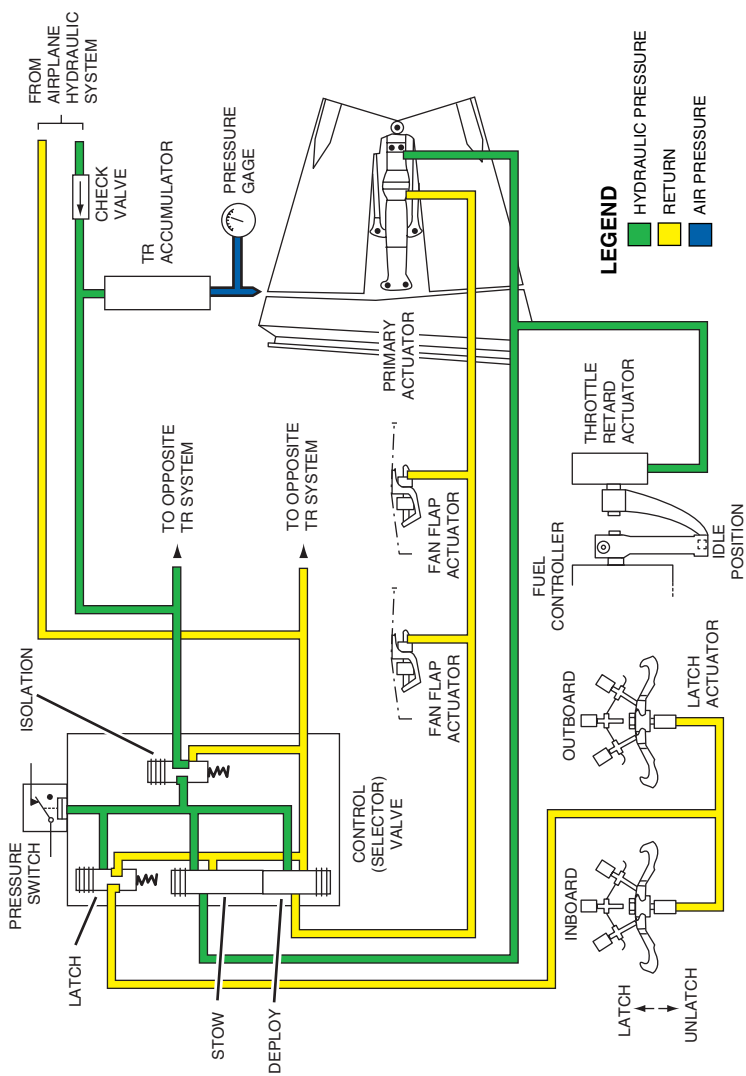


Figure SR-35. Thrust Reverser System—Normal Stow Cycle

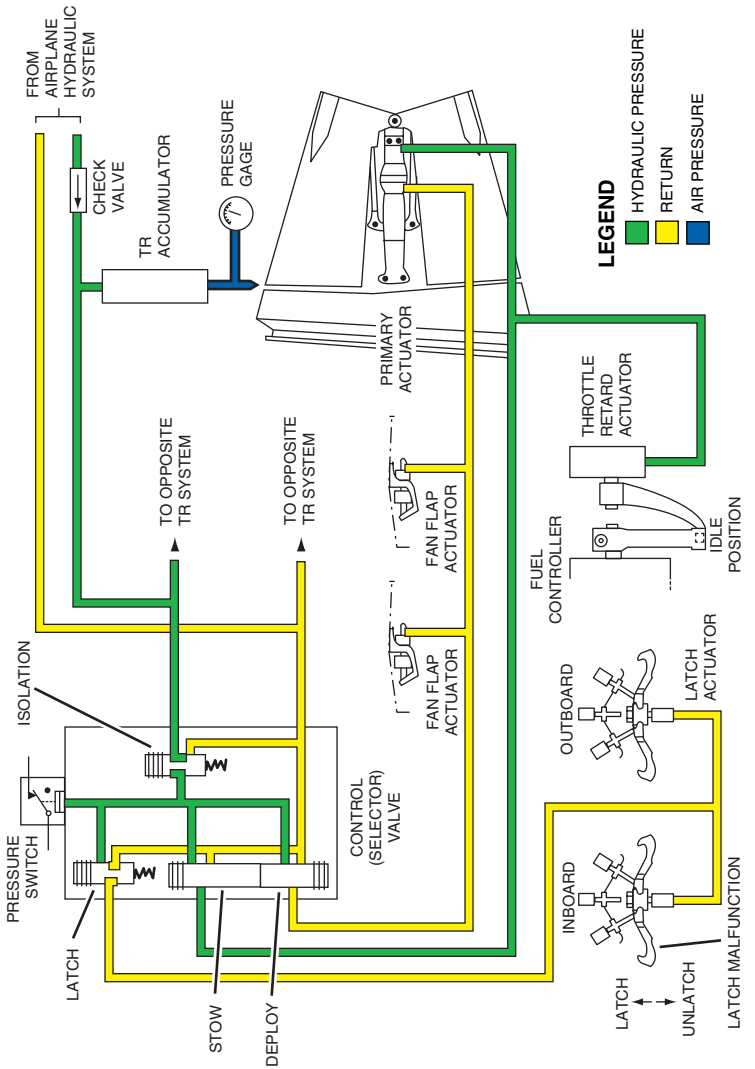


Figure SR-36. Thrust Reverser System—Autostow

Automatic Throttle Retard

The throttle retard installation uses hydraulic pressure from the reverser system to force the engine fuel control mechanism toward idle when a stow signal is generated.

Should an inadvertent stow of the reverser occur while the reverser piggyback lever is in a reverse thrust range, the throttle retard mechanism automatically retards the reverser lever toward the reverse idle deploy position.

Electrical Power

Electrical power to operate and control the thrust lever is taken from the PE bus bar.

Normal Condition Management

General

Deployment of the thrust reverser on unpaved surfaces is restricted to reverse idle thrust.

Reverser Door Pins

The reverser doors may be pinned in the open or closed positions. It is not permissible to pin only one door. The airplane may be operated with the doors secured in the closed position.

External Check

Before performing the external check, ensure that the OFF annunciators on the thrust reverser panel are illuminated. At each engine aft nacelle cowl, check that all access panels are securely fastened and that the thrust reverser clamshell doors are fully stowed. Ensure that safety pins are removed from the reverser doors. From the rear of the engine, check that fan flaps are retracted.

CAUTION

Reverser doors can be deployed without the engines operating. If the reverser doors are deployed, they must be stowed before engine start. One crewmember must observe outside while another operates the system.

Before Starting Engines

Press the FLT ANNUN TEST button, and ensure that the thrust reverser control panel annunciators illuminate. Ensure that the THRUST REVERSER POWER switch OFF annunciators are illuminated.

Landing

1. After touchdown, with the throttles at IDLE, lower the nosewheel to the runway.
2. Select lift dump, and use the wheel brakes in the normal manner.
3. Check that the ARM annunciators are illuminated.
4. Pull both reverser levers up to the deploy position.
5. When the UNLCK and REVRS annunciators illuminate and the thrust reverser lever balks have released, the thrust reverser lever position may be selected as required.

NOTE

Reverse thrust may be reduced to idle by 50 knots.

Engine Shutdown

1. Before parking, place the thrust reverser levers to stow.
2. Check that the REVRS and UNLCK annunciators are extinguished.
3. Press the THRUST REVERSER POWER switch, and ensure that the OFF annunciator is illuminated.
4. Complete the engine shutdown procedures.

Limitations

- Deployment of either thrust reverser is restricted to ground operations only
- Engine starts with reversers deployed are prohibited
- Use of reversers for power backing of the airplane is prohibited
- Deployment of the thrust reversers on unpaved surfaces is restricted to reverse idle thrust.
- Full reverse minimum speed is 50 knots.

ICE AND RAIN PROTECTION

GENERAL

Following is general data concerning the ice and rain protection:

- 7.4 KVA, 208 VAC, random Hz
- Windshield—Stretched acrylic and heated
  - OVHT lights remain on with overheat
  - Panel B—Heated window
  - Panel C—DV window
- Left alternator—Powers left windshield and right panel B
- Right alternator—Powers right windshield and left panel B
- Single alternator—Powers both windshields; drops power to panels B (side windows)
- Both alternators on line:
  - Left alternator powers left stall vane anti-icing
  - Right alternator powers right stall vane anti-icing
- One alternator failed:
  - Stall vane anti-ice power transfers to the No. 2 inverter if both inverters are operating
  - If one inverter fails, there is no vane heater supply

ELECTRICAL SUPPLY

PE Bus Bar

- Left pitot heater
- Pitot heater fail warning
- Annunciators
  - ANTICE LO PRESS
  - ANTICE LO QTY
  - ICE PROT ⇑
- TKS contents indicator (ground)

PS1 Bus Bar

- Wing inspection lamp (left)
- Rudder bias strut heaters
  - Half—PS1 bus bar
  - Half—PS2 bus bar

PS2 Bus Bar

- Ice warning annunciators
- Airframe deice pump
- Chime unit
- Right pitot heater
- Forward static plates
- TKS contents indicator (flight)
- Rudder bias strut heaters
  - Half—PS1 bus bar
  - Half—PS2 bus bar
- Wing inspection lamp (right)

XS2 Bus Bar

- Rotary ice detector

LIMITATIONS

CAUTION

When not in icing conditions, do not use engine anti-icing for more than ten seconds in ambient air temperatures above 10°C.

If ground cold-soaked at a temperature below –10°C, the windshield heat should be operative and selected ON for a minimum of five minutes prior to takeoff in ambient temperatures below —10°C, and for a minimum of 15 minutes prior to takeoff in ambient temperatures below —20°C. If these times are not achieved, airspeed should be restricted to 257 KIAS up to 8,000 feet.

If windshield fails or is turned off in flight, airspeed should be restricted to 257 KIAS below 8,000 feet.

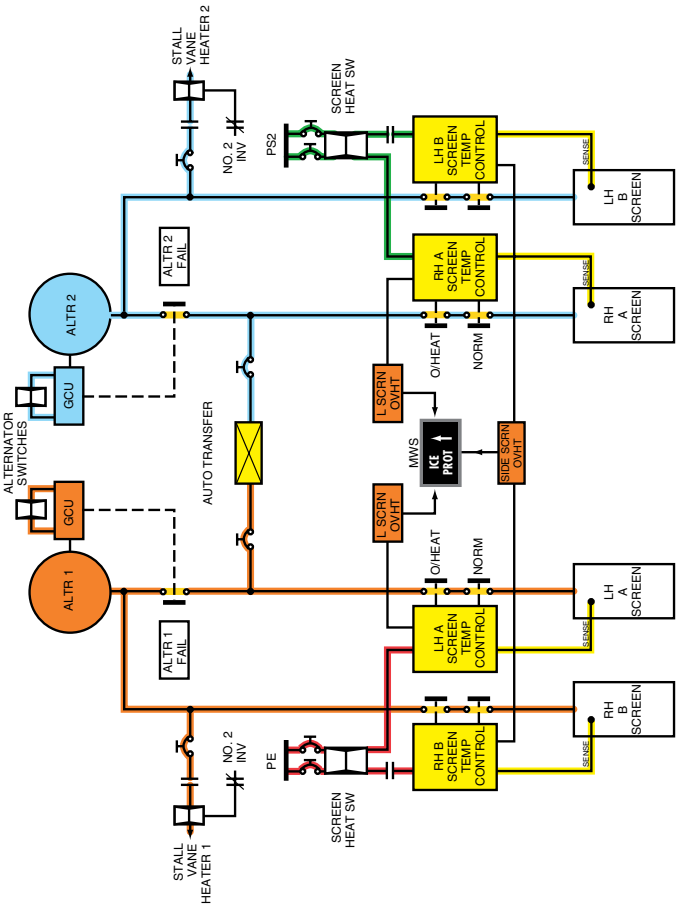


Figure SR-37. Windshield Heat Schematic

AIRFRAME ANTI-ICING

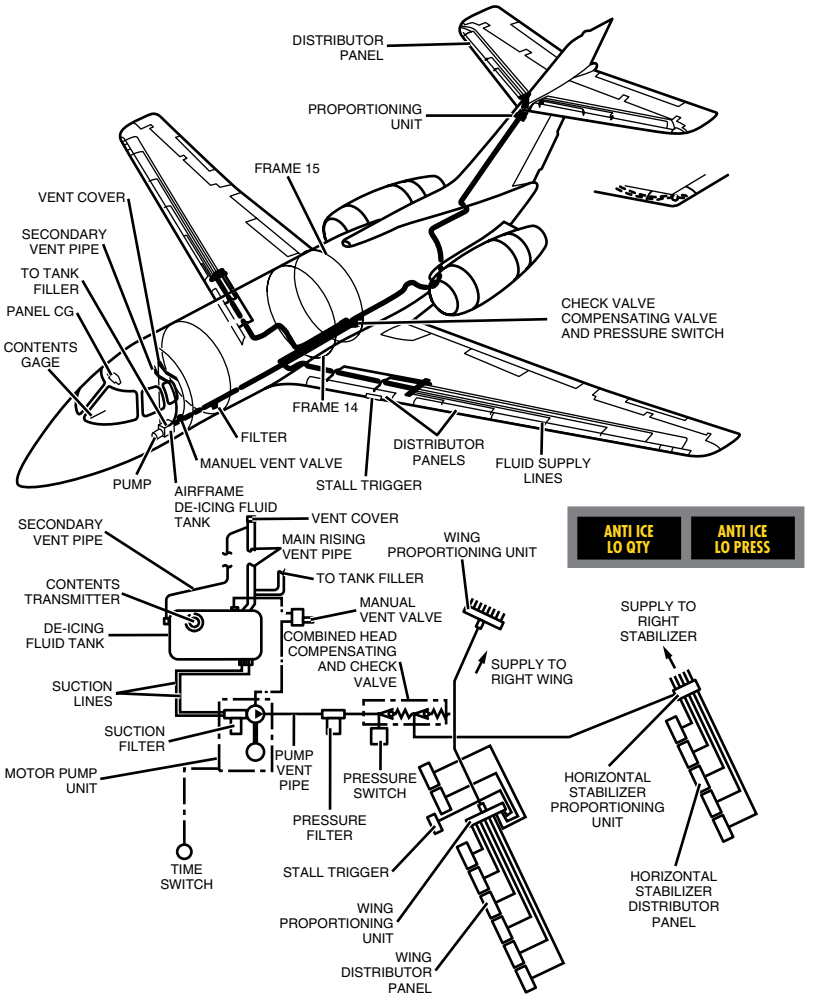


Figure SR-38. Airframe Anti-icing

REAR BAY OVERHEAT

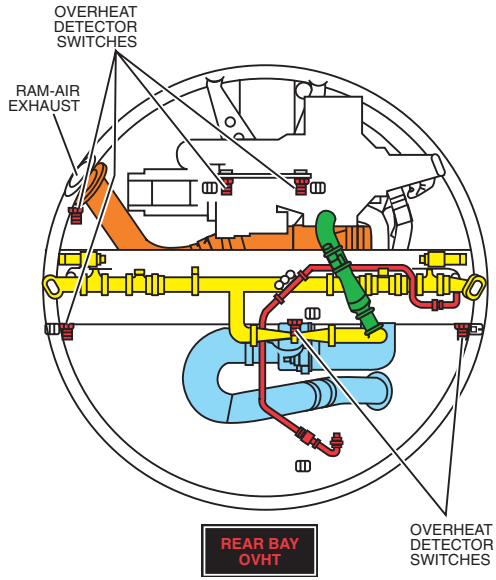


Figure SR-39. Rear Equipment Bay Detection

ENGINE AND APU FIRE DETECTION AND PROTECTION

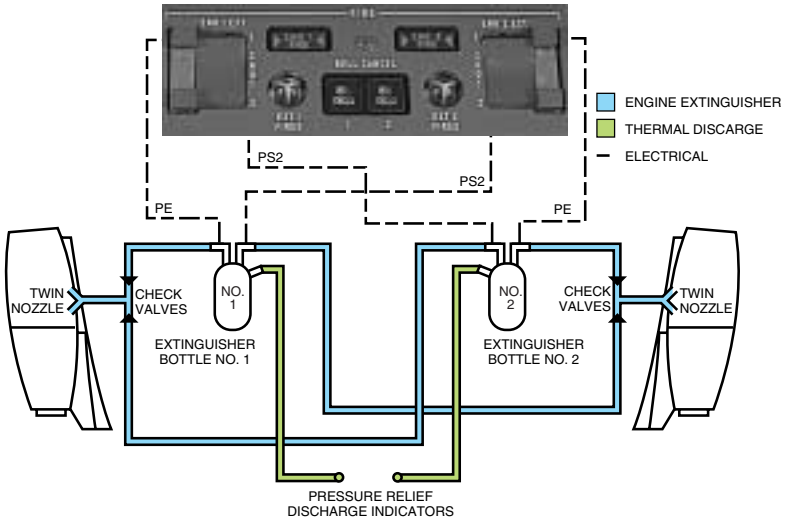


Figure SR-40. Engine Fire-Extinguishing System

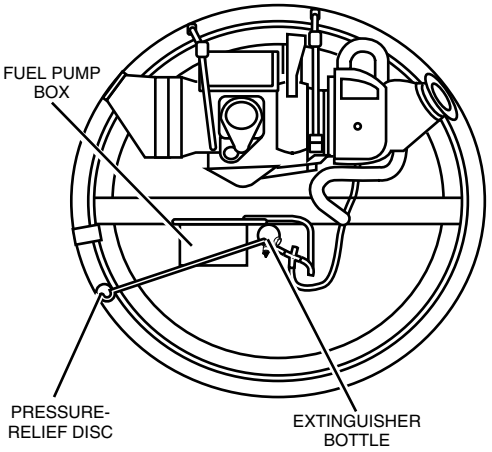


Figure SR-41. APU Extinguisher System

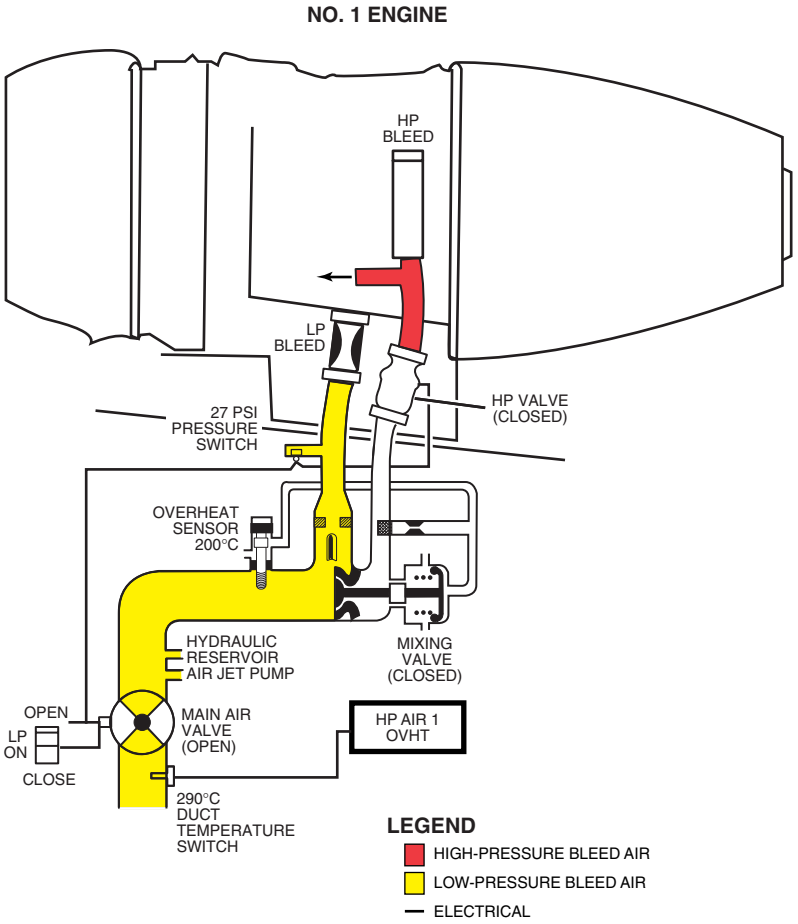


Figure SR-42. Pneumatic System—HP and Mixing Valves Closed

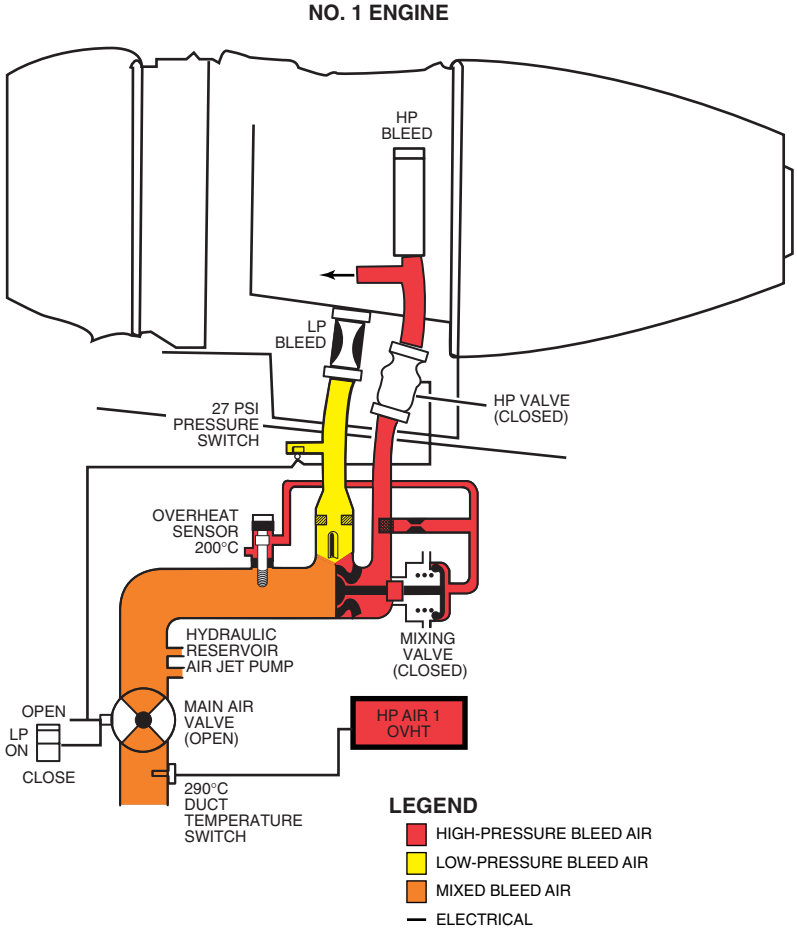


Figure SR-43. Pneumatic System—HP and Mixing Valves Open

AIR-CONDITIONING SYSTEM

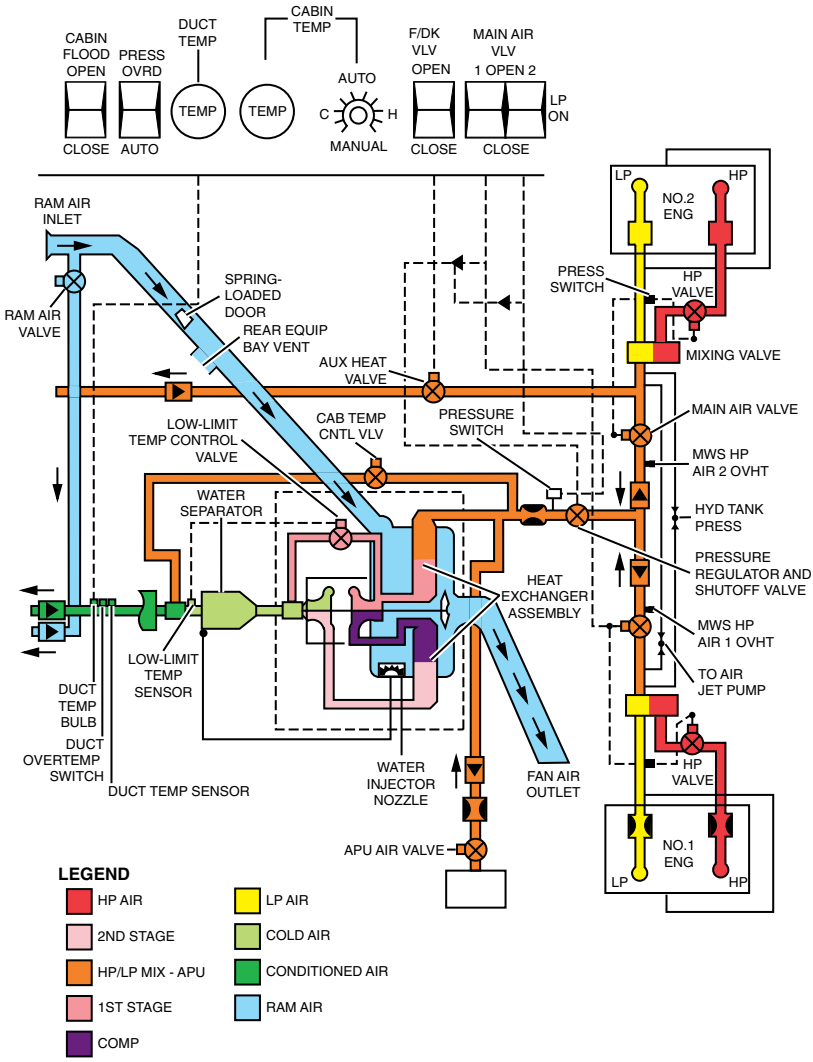


Figure SR-44. Pneumatic and Air-Conditioning System

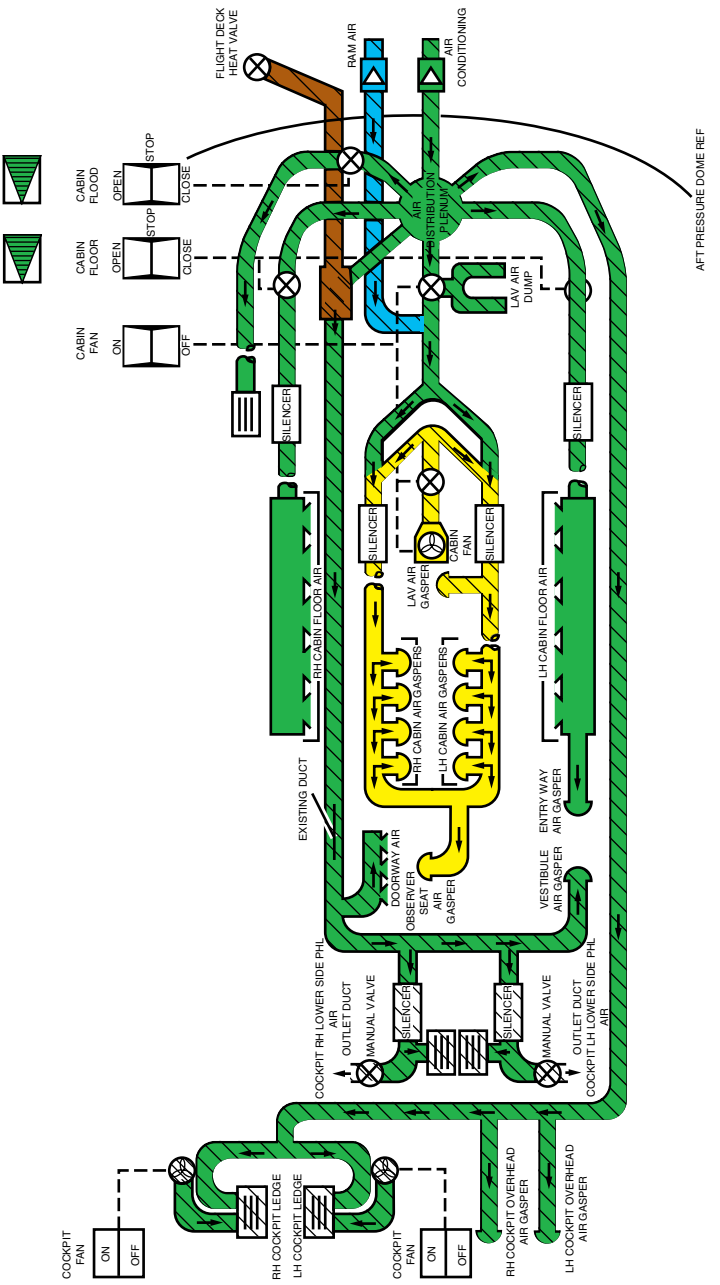


Figure SR-45. Air Distribution Block Diagram

PITOT STATIC

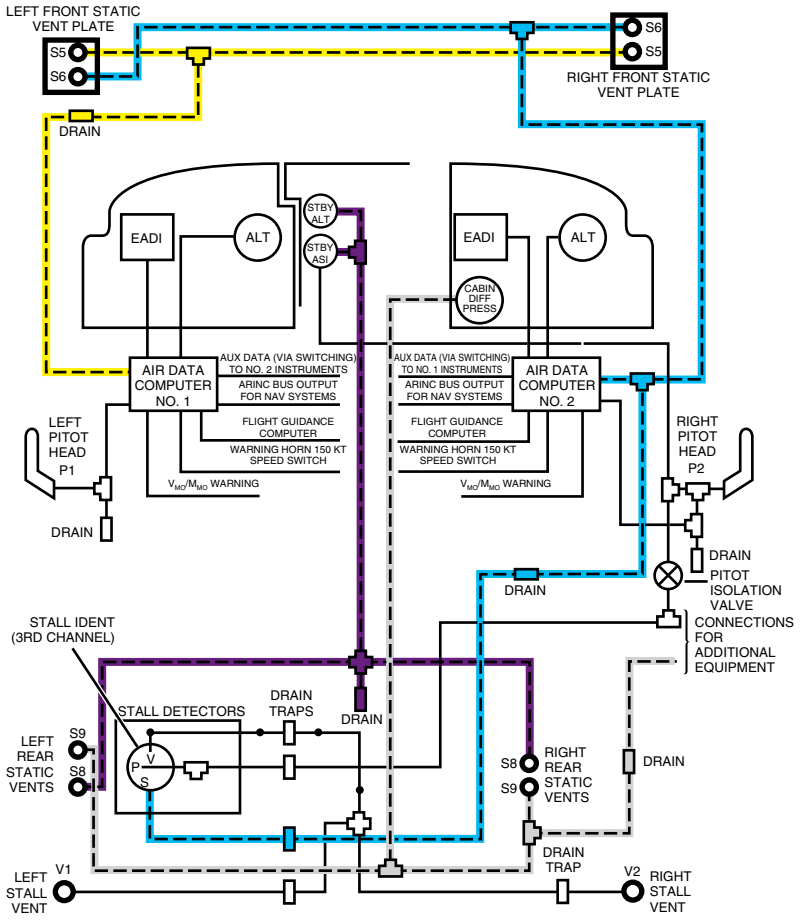


Figure SR-46. Pitot-Static and Stall Vent Systems

PRESSURIZATION

Electrical power for the pressurization system components is provided from the following:

PE BUS BAR

- Cabin Altitude Warning
- Ram-Air Valve Control

PS2 BUS BAR

- Recirculating Fan Control
- Flood-flow Valve Actuator

XS2 BUS BAR

- Fan-operated venturi

Specifications for the pressurization system include the following:

- Maximum Airplane Altitude ..... 41,000 FEET
- Maximum Cabin Differential Pressure ..... 8.55 PSID
- Negative Safety Release ..... –0.5 PSID
- Cabin Altitude Warning ..... 9,300 ±300 FEET
- Pressure Regulator ..... 13,000 ±1,500 FEET

Figure SR-47 illustrates the pressurization system operation.

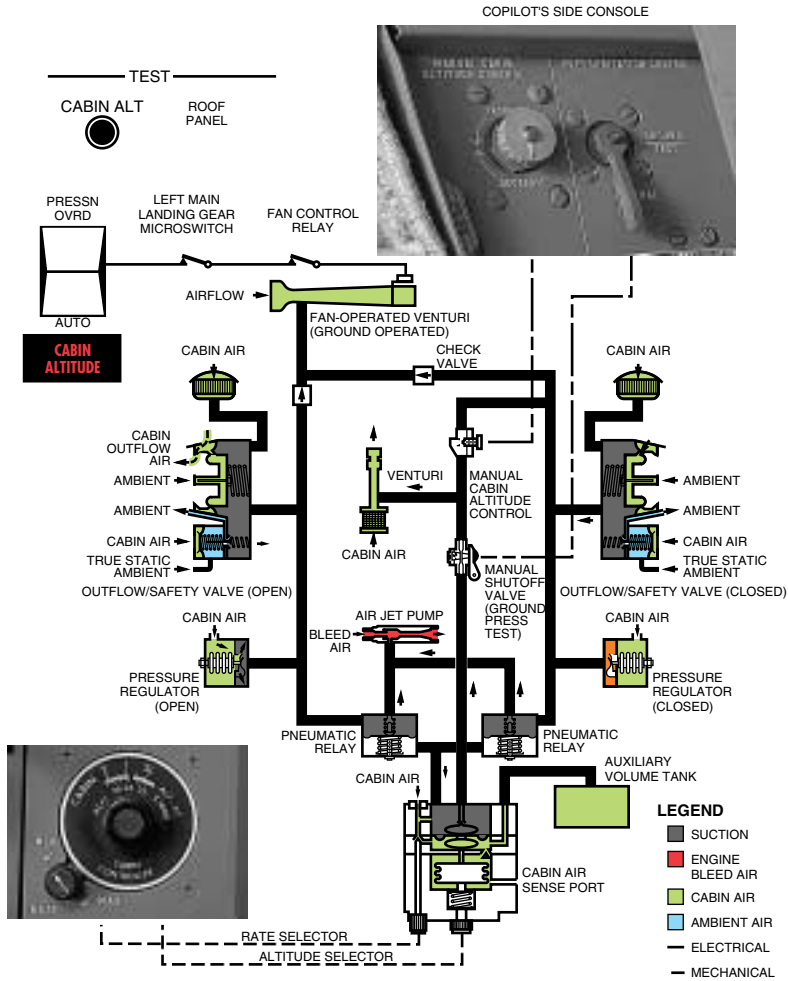


Figure SR-47. Pressurization System Diagram

OXYGEN SYSTEM

Table SR-4 depicts the average time of useful consciousness (time from onset of hypoxia until loss of effective performance) at various altitudes. Table SR-5 shows the expected oxygen duration and is based upon an emergency descent from any altitude and continuation cruise at between 10,000 feet and 20,000 feet with two 750-liter oxygen cylinders initially full (1,800 psi). Figure SR-48 illustrates the oxygen system.

Table SR-4. AVERAGE TIME OF USEFUL CONSCIOUSNESS

15,000 to 18,000 feet	30 minutes or more
22,000 feet	5 to 10 minutes
25,000 feet	3 to 5 minutes
28,000 feet	2 1/2 to 3 minutes
30,000 feet	1 to 2 minutes
35,000 feet	30 to 60 seconds
40,000 feet	15 to 20 seconds
45,000 feet	9 to 15 seconds

Table SR-5. OXYGEN DURATION

PERSONS USING OXYGEN		APPROXIMATE DURATION OF SUPPLY (MINUTES) (SEE NOTE 1)
FLIGHT CREW (ON NORMAL)	CABIN OCCUPANTS	
2	0	147 (see note 2)
2	1	100
2	2	73
2	3	55
2	4	46
2	5	34
2	6	27
2	7	21
2	8	17
2	9	12
2	10	10

NOTE:

1. For airplanes fitted with a third 750-liter oxygen cylinder, increase the given duration by 50%.
2. The use of 100% oxygen below 20,000 feet decreases the duration of the supply.
   For example:
   With two crewmembers (on 100%) and 0 passengers at 15,000 feet,
   the duration is approximately 70 minutes.

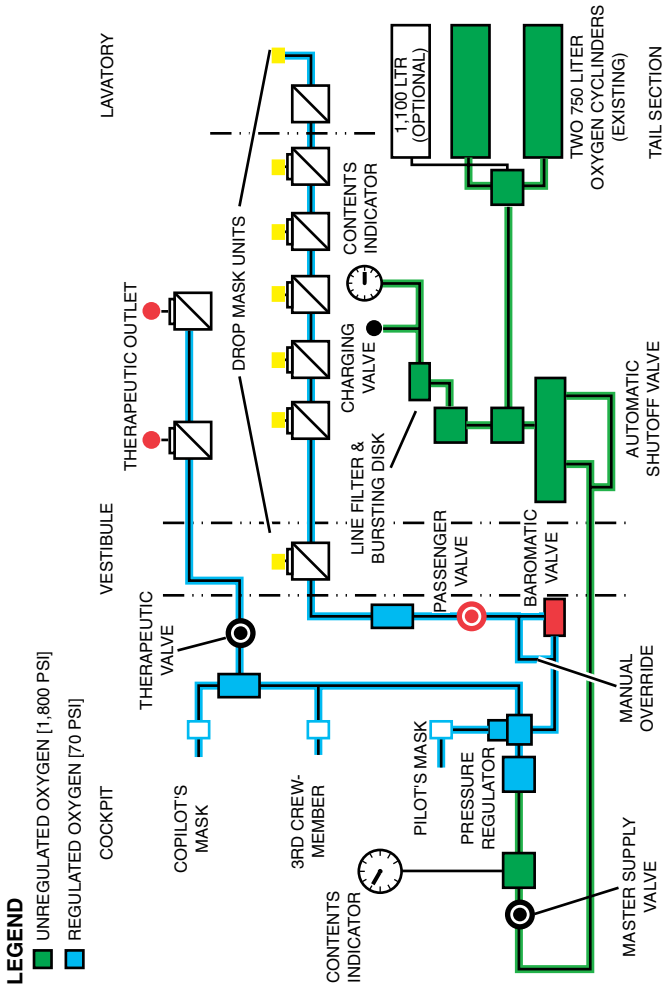


Figure SR-48. Oxygen System

ENGINE ANTI-ICE

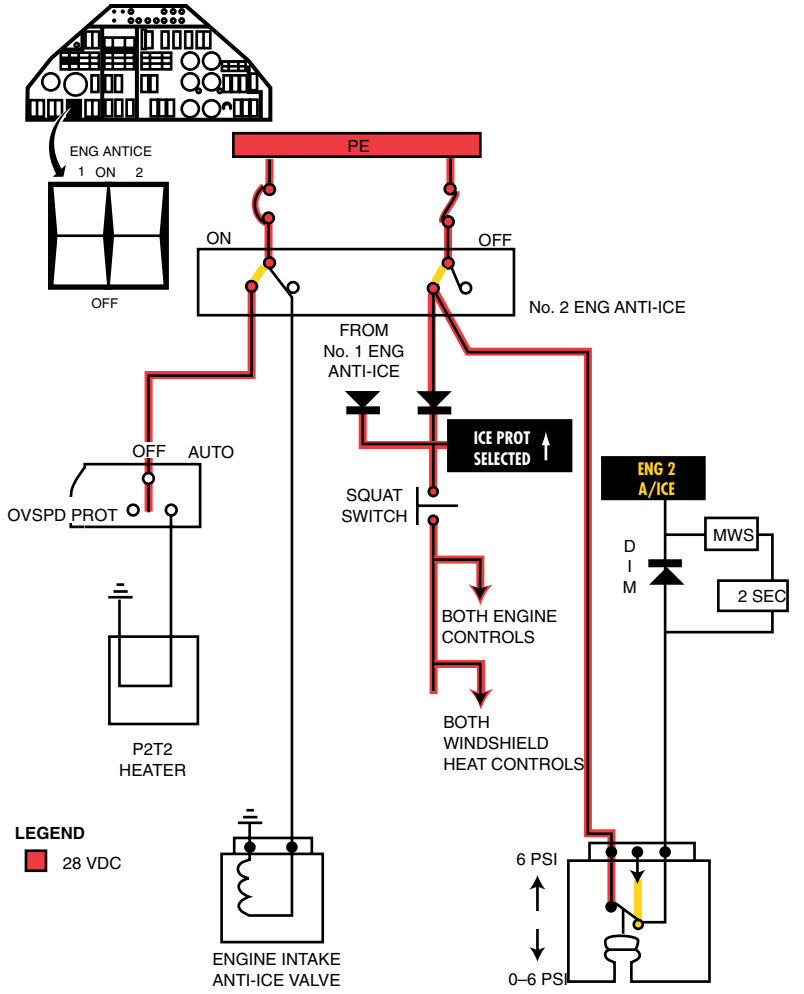


Figure SR-49. Engine Anti-ice Schematic

POWERPLANT—VENTILATION

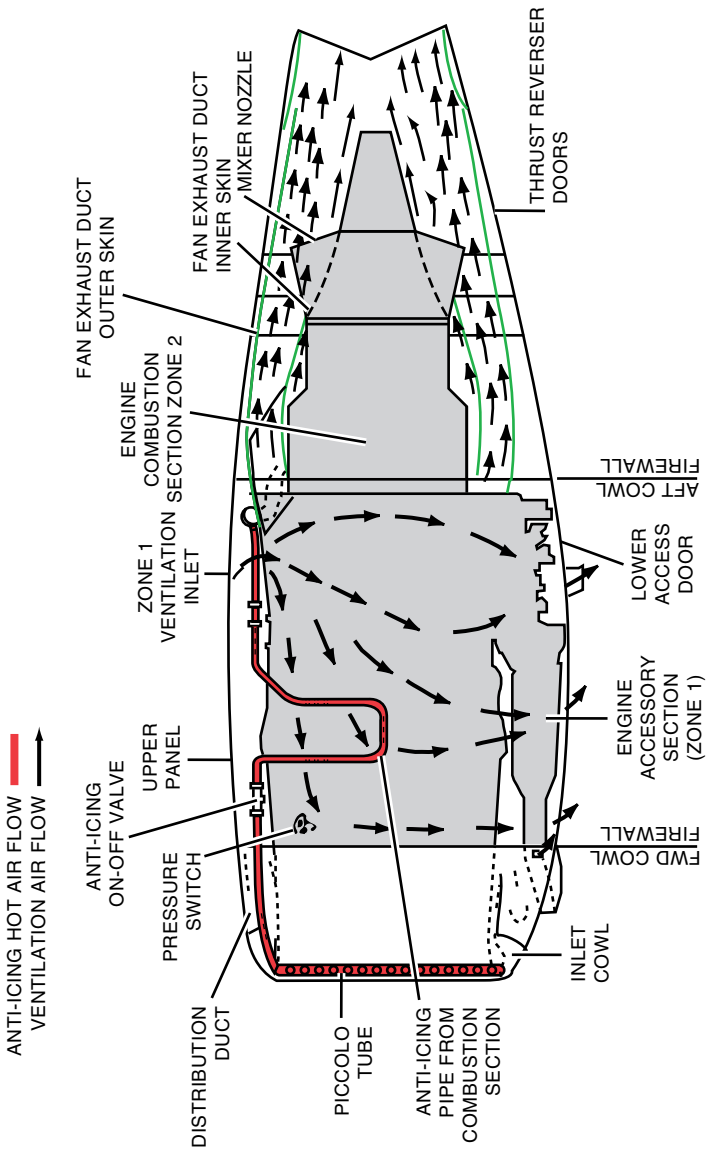


Figure SR-50. Engine Air Bleeds and Ventilation

SOLAR APU

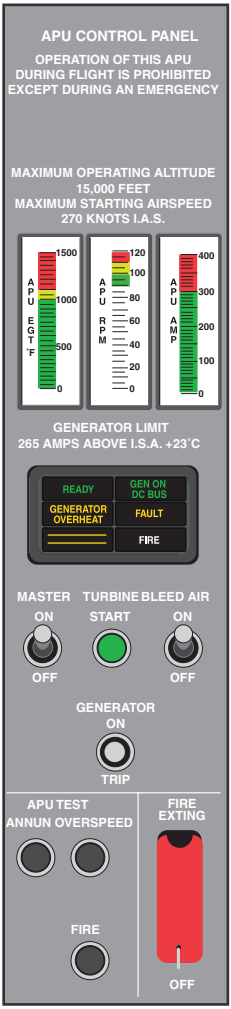


Figure SR-51. Solar APU Panel

GARRETT APU

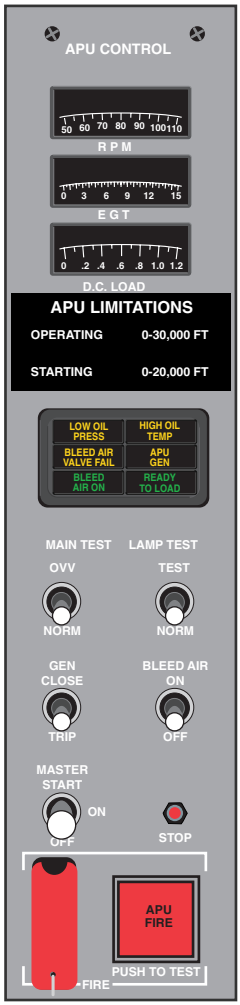


Figure SR-52. Garrett APU Control Panel

MASTER WARNING

TABLES

Table	Title	Page
MW-1	Engine Fire Lights	MW-1
MW-2	Center Annunciator Panel	MW-1
MW-3	Ice Protection	MW-4
MW-4	Fuel	MW-5
MW-5	DC Power	MW-6
MW-6	AC Power	MW-7

MASTER WARNING

Table 1. ENGINE FIRE LIGHTS

ANNUNCIATOR	CAUSE FOR ILLUMINATION
ENG 1 FIRE ENG 2 FIRE	A fire or overheat is detected for the indicated engine.

Table 2. CENTER ANNUNCIATOR PANEL

ANNUNCIATOR	CAUSE FOR ILLUMINATION
APU WARN	An annunciator on the APU panel is illuminated. (Solar APU)
REVERSER	Ground–Rudder bias is not inhibited. Flight–Autostow is activated.
MACH TRIM FAIL	Restrict speed to Mach 0.73 or less, unless autopilot is engaged.
HP AIR 1 OVHT HP AIR 2 OVHT	Engine bleed-air temperature is excessive.
REAR BAY OVHT	An overheat condition exists in the rear equipment bay.
ENG 1 FIRE ENG 2 FIRE	A fire or overheat condition is detected for the indicated engine.
CABIN ALTITUDE	Cabin altitude has reached 9,300 feet.

Table 2. CENTER ANNUNCIATOR PANEL (CONT)

ANNUNCIATOR	CAUSE FOR ILLUMINATION
OIL 1 LO PRESS OIL 2 LO PRESS	Engine oil pressure is less than 25 psi.
ELEV/AIL TRIM	The elevator/aileron is mistrimmed prior to takeoff.
HYD 1 LO PRESS HYD 2 LO PRESS	Pressure from the indicated hydraulic pump is 1,500 psi or less.
HYD OVHT	The main hydraulic system has overheated.
MAIN AIR VALVE 1 MAIN AIR VALVE 2	Either main bleed-air valve is not in the selected position (time delay of 50 seconds) or the valve is open while the airplane is on the ground.
AUX HYD LO LEVEL	The auxilliary hydraulic tank is not full.
ENG 1 CMPTER ENG 2 CMPTER	Steady light indicates the associated engine fuel computer has failed or the switch is in the OFF or OVSD PROT position.
EMRG BRK LO PRESS	The emergency brake accumulator pressure is 2,250 psi or less.
ENG 1 A/ICE ENG 2 A/ICE	Either engine's air is not available for anti-icing.

Table 2. CENTER ANNUNCIATOR PANEL (CONT)

ANNUNCIATOR	CAUSE FOR ILLUMINATION
ICE PROT	An annunciator on the ICE PROTECTION roof panel is illuminated.
ELEC	An annunciator on either DC or AC power roof panels is illuminated.
FUEL	An fuel roof panel annunciator is illuminated.
DUCT OVHT	An overheat condition exists in air conditioning ducts.
ENT DOOR UNLOCKED	The entry door is not properly secured.
APU MASTER ON	The APU master switch is in the ON position. (Solar APU)
RUDDER BIAS	One or both rudder bias switches are in the OFF position.
ICE PROT SELECTED	Either engine ice protection system is selected.
FUEL XFD TFR	The WING FUEL XFD/TFR or AUX FUEL TRF light on the roof panel is illuminated.
STALL INDENT	An annunciator on the left or right stall identification panel is illuminated.

Table 3. ICE PROTECTION ANNUNCIATORS

ANNUNCIATOR	CAUSE FOR ILLUMINATION
L SCREEN OVHT R SCREEN OVHT	Indicated windshield has reached the overheat limit.
ALTR 1 FAIL ALTR 2 FAIL	Indicated engine-driven alternator has failed.
L VANE HTR FAIL R VANE HTR FAIL	Indicated vane heater has failed.
SIDE SCRN OVHT	Indicates left or right side window has overheated.
ICE DETECTED	Airframe ice has been detected.
PITOT HTR FAIL	Indicates loss of left or right pitot heat.
ANTICE LO PRESS	Indicates low-pressure output from airframe anti-icing pump.
ANTICE LO QTY	Indicates airframe anti-icing quantity low.
IGN ON	Indicates one or both continuos ignition circuits is energized.

Table 4. FUEL ANNUNCIATORS

ANNUNCIATOR	CAUSE FOR ILLUMINATION
ENG 1 FUEL ENG 2 FUEL	Indicated fuel filter differential is excessive, or fuel temperature in the indicated engine fuel pumps is above normal.
REFUEL ON	Any valve in the refuel system is not in the closed position.
AUX FUEL TFR	Auxiliary fuel transfer lever is in open position.
WING FUEL XFD/TFR	Wing fuel crossfeed transfer lever is in crossfeed or transfer position
FUEL 1 LO PRESS FUEL 2 LO PRESS	Fuel pressure in the supply line to the respective engine is low.

Table 5. DC POWER ANNUNCIATORS

ANNUNCIATOR	CAUSE FOR ILLUMINATION
BATT 1 OVHT BATT 2 OVHT	Indicated battery temperature is out-of-limits high. (Nicad batteries only.)
BATT 1 CNTCTR BATT 2 CNTCTR	Indicated battery is not charging or emergency contactor is open.
BATT 1 HOT BATT 2 HOT	Indicated battery temperature is high. (Nicad batteries only.)
GEN 1 FAIL GEN 2 FAIL	Indicated generator has failed.
BUS TIE OPEN	The PS1 to PS2 bus-tie contactor is open.

Table 6. AC POWER ANNUNCIATORS

ANNUNCIATOR	CAUSE FOR ILLUMINATION
XS 1 FAIL XS 2 FAIL XE FAIL	Indicated AC bus has failed.
INV 1 FAIL INV 2 FAIL	Indicated inverter has failed.
STBY INV ON	The standby inverter is selected on.